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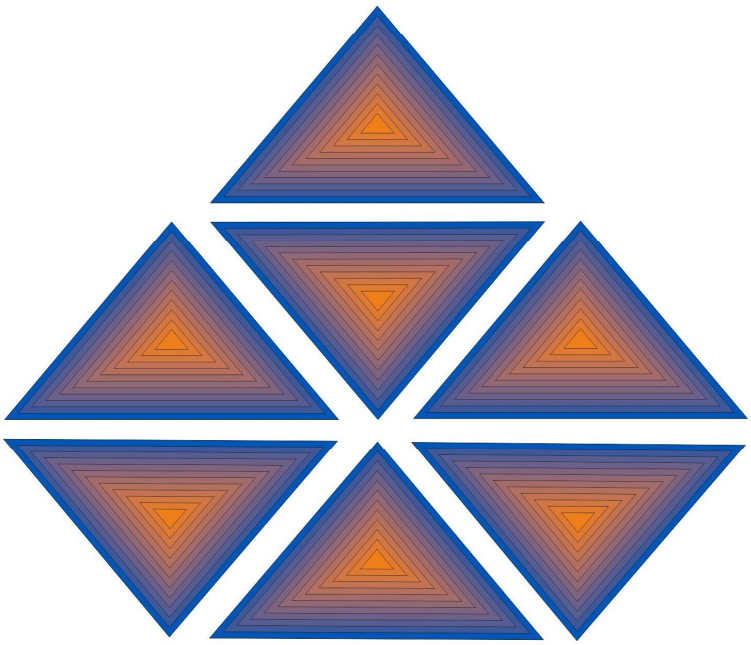

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PROMOTING SUSTAINABLE DEVELOPMENT GOALS (SDGs) AT SCHOOLS: ACHIEVEMENTS AND CHALLENGES

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Promoting the Sustainable Development Goals (SDGs) within school environments is crucial for fostering a generation equipped to address global challenges. One of the primary achievements has been the increasing awareness and integration of SDGs into curricula (Boeren, 2019). Many schools worldwide have incorporated lessons, projects, and activities that address specific goals, such as SDG 3 (good health and well-being), SDG 4 (quality education), and SDG 5 (gender equality). This integration fosters a deeper understanding of interconnected global issues among students, encouraging them to turn those concerns into active steps to overcome the issues (Stephens et al., 2008). These hands-on activities provide practical experience and solidify the concepts learned in the classroom, empowering students to take tangible action within their communities.

Through the University Social Responsibility (USR) program, the university is vital in supporting social sustainability, including social equity, economic development, and environmental protection. Integrating SDGs issues into curricula is a significant trend in universities worldwide (Huang & Do, 2021). The goal is to immerse students in a solution-oriented learning experience and prepare them to become agents of social change. For instance, action research-based university projects showcase innovative approaches to addressing real-world challenges. University programs integrating rural community development into student learning have successfully merged academic objectives with community problem-solving, enriching both student experiences and local capacities.

Additionally, several studies emphasize the transformative potential of SDG 4 in fostering inclusive and equitable education. Research on online lesson studies and e-learning platforms demonstrates their ability to overcome geographical barriers, particularly in underserved areas. For example, reflective practices among teachers have improved significantly through online platforms, promoting professional growth and enhanced teaching quality. Articles also discussed policymaking and implementation of security measures, health, and educational equity.

The articles in this theme issue collectively emphasize the intersection of education, sustainability, and community engagement. They underline the importance of innovative teaching practices, emotional intelligence, and sustainable facility design in achieving broader societal goals. Promoting SDGs at schools represents a complex yet rewarding endeavor. While significant achievements in quality education, gender equity, and early childhood development are evident, challenges such as resource inequalities, digital divides, and cultural barriers persist. Educators and policymakers can advance the dual goals of sustainability and social equity by

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integrating innovative practices, fostering emotional intelligence, addressing systemic issues, and strengthening community ties.

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UNDERSTANDING HOW AMERICAN SCHOOL DISTRICT ADMINISTRATORS FROM THE MIDWEST MAKE DECISIONS ABOUT POLICE PRESENCE IN US SCHOOLS

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Abstract

Since the 1950s, police presence in American schools has increased in the form of school resource officers (SROs). Some schools have elected to staff SROs on their school grounds, while others have chosen to avoid police presence at their school site. It is poorly understood how school administrators make decisions about staffing SROs in their schools and what the perceived impact of the SROs is on the school environment. This research attempts to understand how school administrators make decisions about whether to add, maintain, or eliminate SROs in their schools. The recent historical use of police in American schools is reviewed while utilizing the policy streams model as a theoretical lens. This qualitative, interview-based case study examined how 10 midwestern k-12 school districts decided to add, eliminate, or maintain SROs. Analyzed data offered comprehensive insights into the decision-making processes and key factors involved. Findings revealed the influence of student safety, emotional triggers, and budget considerations on administrators' choices regarding SRO presence.
Keywords: *arrest rates, school district administrators, mental health, policing, school resource officers*

Introduction

Over the course of the 20th century, police presence in American society has extended into American public schools. Police who are embedded in schools are known as school resource officers (SROs). The presence of SROs is consonant with the general direction of law enforcement in the United States, and this approach to policing has resulted in one of the highest incarceration rates in the world as well as a growing visible presence of armed police officers in many areas of public life (Lurigio, 2024). The presence of SROs in American schools significantly influences the safety and security of educational environments, which directly impacts the United Nations Sustainable Development Goal (SDG) of ensuring an inclusive and equitable quality education (Elfert, 2019). Providing safe environments for students to learn is a global concern. Therefore, understanding how American school administrators, who lead some of the most heavily policed schools in the world, make decisions about SRO presence may be instructive for education professionals in many countries who are attempting to provide equitable educational opportunities within secure school sites.

The decision-making processes regarding adding, eliminating, or maintaining SROs within school districts, however, are poorly understood. This qualitative, interview-based case study posed the following question: How do American school district administrators navigate decisions about whether to add, eliminate, or maintain SROs in their schools? The findings from this study are presented and suggest that the future of SROs in American schools is undecided, driven by local events and concerns rather than national policy initiatives.

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The researchers convey a brief history of policing in American schools while employing Kingdon's (2003) policy streams model as a theoretical framework to gain insight into how the leaders in this study made decisions. Kingdon's policy streams model has been previously applied as a theoretical framework in other research to understand the progress of initiatives relating to the United Nation's Sustainable Development Goals in education (Sumida, 2017).

In light of the steady increase in police presence in American schools over the last few decades, it is still unknown how school administrators make decisions regarding the introduction of police presence into schools and what is driving the most recent increases of SROs in American public schools. Also unknown is the impact that SROs have on the perceived total school environment. Therefore, as policymakers consider responses to maintaining schools as safe and productive learning environments, it is important to understand why American schools are experiencing an overall increase in SROs, how administrators weigh decisions about whether to introduce SROs to their schools, and what impact SROs are perceived to have on the school environment. These are the issues that the research addresses.

The History of SROs and the Policy Streams Model

The history of SROs in the United States originated in Flint, Michigan, during the 1950s with the goal of encouraging positive relationships between police officers and local youth, and reducing criminal activities (Scherer, 2022). Originally, a police presence in schools was viewed as a response to the perceived juvenile delinquency crisis of the 1950s (Gilbert, 1986). As the concept gained traction, other communities, cities, and states began incorporating SROs into their school districts in the ensuing decades (McKenna & Petrosino, 2022).

By the 1980s, juvenile delinquency, the original justification for SROs had become an outdated concept that no longer captured the problems that were perceived to have besieged American youth. The mid-1980s saw the introduction of the DARE (Drug Abuse Resistance Education) program. The national DARE movement significantly increased the presence of SROs in schools, while raising the specter of illegal drugs as a new rationale for police presence in schools. Supported by federal funding (*Financial Institutions Reform, Recovery, and Enforcement Act of 1989*, 1989), DARE became widely implemented in schools, providing money for substance abuse prevention education as well as the placement of SROs into local schools. Despite its popularity, academic studies revealed that DARE actually had minimal impact on reducing drug use among students (Ingraham, 2017). Nevertheless, the program persisted, with over $1 billion allocated to it by the Bureau of Alcohol, Tobacco, and Firearms over its lifetime (Bureau of Tobacco, Alcohol, Firearms, and Explosives, 2015). Because of DARE, the presence of police in schools proliferated across the United States with these school-based police officers being considered part of Reagan's "War on Drugs." Eventually, the DARE program came under increasing scrutiny, with critics leveling the claim that the program was used to desensitize children to the aggressive policing tactics that would become routine in the ensuing decades (Felker-Kantor, 2024). DARE lost US federal funding in 1998 and entered a period of contraction, eventually formally closing in 2009 with a mixed legacy. Multiple studies found no relationship between drug use and the presence of DARE officers, leading to questions about the effectiveness of the program (West & O'Neal, 2004).

By the early 21st century, the American political consensus surrounding drugs as well as school safety had evolved in identifiable ways. The Obama administration, recognizing that the "War on Drugs" had failed, emphasized more lenient policies for those convicted of drug offenses (Porter, 2012). Simultaneously, the 1999 Columbine High School shootings, the first of many mass school shootings in the United States, signaled a new and persistent problem in American schools. The Columbine mass shooting shattered the perception of schools as safe environments for students and signaled that school-based gun violence, rather than drugs,

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would be the new primary justification for placing SROs in schools. The Center for Public Integrity (2021) reported that between 1999 and 2005, the federal government distributed over $750 million in funding to hire almost 7,000 SROs nationwide in a stated attempt to stem the increasing wave of school shootings.

The history of SROs in American schools is readily understood by applying Kingdon's (2003) policy streams model as an explanation for how problems are understood, and relevant public policies are decided on and applied as solutions. The policy streams model suggests that there are three different streams: The problem stream, the politics stream, and the proposal stream. According to Kingdon (2003), if these three streams converge, a policy window is created that allows changes or advances in policymaking. All streams need to reach optimal conditions for policy change to occur.

In Kingdon's (2003) view, the problem stream reaches an optimal condition when "people define conditions as problems by comparing current conditions with their values concerning more ideal states of affairs" (p. 19). Justifications for increasing police presence, such as juvenile delinquency, the drug problem, and school shootings, are all focusing events. According to Kingdon (2003) problems "need a little push to get the attention of people in and around government" (pp. 94–95). Once a problem is identified and framed then, the political stream will activate, building broad recognition that an "issue" is understood as a "problem." This building of public pressure then creates the conditions for the proposal stream to solicit remedies for the problem in the form of policies. When all of this occurs within a relatively short timeframe, a policy window occurs that allows change.

If the policy streams model is applied to the case of SROs, it is clear that the problem stream in the 1950s was juvenile delinquency. The political stream consisted of public pressure to solve this perceived problem. The policy proposal stream was the introduction of SROs into schools. Once SROs were introduced into schools, the policy proposal stream as it relates to safety concerns in schools, became relatively fixed, as SROs represented a ready policy solution for any future perceived problems. So, in the 1980s when the problem stream and political stream combined to introduce the idea that the War on Drugs, rather than juvenile delinquency, was the pressing "youth problem" to be solved in the United States, SROs were a convenient policy proposal to address the new problem.

As the War on Drugs was ending, the mass shooting events in US schools caused a new political reality, introducing school gun violence as the most critical safety problem to be solved in schools. The simultaneous change in drug enforcement policy in the US, combined with an increase in school shootings ushered in a new problem stream (school gun violence) while creating a new political stream (political pressure to address school shootings in some way). The convergence of these streams caused a new policy proposal window to materialize. This resulted in an ever-greater commitment to the placement of SROs in American schools while focusing their attention on the prevention of school shootings rather than drug prevention. In 2022, a full 46% of public schools in the United States reported having an SRO on-premises, while an additional 25% of public schools indicated that they had non-police security personnel (Kirby, 2024). Through Kingdon's (2003) model, we can clearly establish why police presence in American schools has increased.

Despite an increase in federal funding for SROs across the United States, police presence is not mandated from above. After all, educational policymaking in America occurs in partnership between the local schools, state governments, and the US federal government. According to US government figures, 4.3% of SRO funding came from US federal government grants while 78.6 came directly from local school district budgets and the rest from local or state government sources (Davis, 2022). While Kingdon's model is useful in understanding the increasing prevalence of SROs on school grounds; individual administrators, despite the convergence of the policy streams model, continue to make a variety of decisions about SROs.

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Kingdon's (2003) concept of bureaucratic knowledge is useful in understanding how the overall movement of governmental policies can be redirected or stopped completely. Bureaucratic knowledge is, by definition, "local knowledge", which is "often implicit or tacitly held by citizens in a community" (Nugroho et al., 2018, p. 37). The findings of this research complicate Kingdon's (2003) policy streams approach as it applies to this issue and offers novel insights about the limits of the federal government to affect local school policies in any education system where power is shared between multiple levels.

Despite having a knowledge of how SROs originated and why their use has expanded in US schools, the factors that individual school administrators take into account in staffing SROs at the local level are not well understood. Simply put, while some school administrators continue to add SROs to their school sites, others elect to discontinue their services. This research attempts to clarify why school administrators are making contrary decisions, in the face of an overall trend to increase SROs in local schools. Using Kingdon (2003) as a theoretical framework, this research investigates how American school district administrators navigate decisions about whether to add, eliminate, or maintain SROs in their schools.

Research Methodology

Background

This research utilized a qualitative case study approach (Stake, 2005). A qualitative case study approach was appropriate as a methodological strategy in this research as it allowed the researchers to deeply understand how school administrators made SRO staffing determinations by collecting rich descriptive narrative interview data. This approach allowed for a thorough understanding of how school administrators arrived at staffing decisions regarding SROs.

Sample

To address the question of how school administrators make decisions about the presence of SROs on their school grounds, the researchers sampled American school administrators from the Midwest. The researchers contacted over 100 administrators via email inviting participation. Ten administrators returned the email invitation and agreed to participate. The administrators represented a variety of districts including urban and suburban. Table 1 provides an overview of the demographic composition of the school district administrators relevant to this study.

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Table 1
Study Sample of School District Administrators' Demographics

Participant	Gender	Race	Years as District Administrator	SROs in District
Suburban School Administrator A	Male	White	10	Yes
Suburban School Administrator B	Female	White	1	Yes
Suburban School Administrator C	Female	Black	7	No
Suburban School Administrator D	Female	White	32	Yes
Suburban School Administrator E	Male	Asian	5	Yes
Suburban School Administrator F	Male	White	7	Yes
Urban School Administrator A	Female	White	5	Yes
Urban School Administrator B	Female	Biracial	4	No
Urban School Administrator C	Female	Black	4	No
Urban School Administrator D	Male	White	10	Yes

Instrument

The researchers utilized semi-structured interviews as the main instrument of data collection and triangulated interview data with other sources described below. In addition to answering basic demographic questions, all participants were interviewed about their decision-making processes related to adding, maintaining, or eliminating SROs within their schools. Table 2 provides an overview of the researcher's interview questions.

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Table 2
Interview Questions

Category	Question
Years in School Administrator Role	How many years have you worked in a school administrator role?
Total Years working in Education	What is the total number of years working as a professional in an educational setting?
Ethnicity and Race	May I ask you to identify your ethnicity and race?
General Decision-Making	Please describe, generally speaking, your decision-making processes regarding your school or school system.
SRO Management	Please describe the decision-making process that you use to add, eliminate, or maintain SROs.
Stakeholders Involved	Who else is involved with these decisions?
Contributing Factors	What other factors contribute to the decisions?
Data Usage	What kinds of data do you use when you make decisions about SROs?
Data Sources	Where do you find the data?
SRO Effectiveness	Given this data, are SROs effective in your school?
Addressing the School-to-Prison Pipeline	What steps are taken to ensure that SROs do not contribute to the school-to-prison pipeline or proportionate discipline?
Performance Evaluation	If an SRO is deemed ineffective in a school, is there a process in place for school officials to evaluate and assess their performance and make decisions?
Alternative Programs	Are there any alternative programs instead of SROs being considered? If yes, what are they?
Communication Procedures	Are there specific procedures in place for communication between the principal or administration and SROs? If so, please explain.
Stakeholder Input	Do you or a district administrator gather input from students, parents, and teachers when making decisions related to SROs or SRO programs?
Policy Guidance	Are there policies that guide your decision-making regarding the involvement of SROs in disciplinary and non-disciplinary matters?

Because the researchers utilized a semi-structured interview approach, the researchers were able to ask all participants probing follow-up questions in order to completely understand and capture the unique perspective and situation of each participant.

Data Collection

Each participant was interviewed via an internet conferencing application such as Zoom. Interviews were approximately 45 minutes to one hour in duration. In addition to the pre-planned research questions, the researchers requested for participants to clarify and elaborate on the situations they described at their schools. This interview procedure was pursued in order to gain thick descriptions of how these administrators decided whether to add, maintain, or eliminate SROs in their school buildings.

The triangulated data collection strategy also included validating participant-provided school district data by reviewing the Institute of Educational Sciences (IES) database as well as the Ohio Department of Education database (9 of the 10 participants were located in the State of Ohio). Data gleaned from these external databases were utilized in the case study to verify

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details about the Midwestern school districts in this case study. The filtered school district data confirmed enrollment rates, the number of SROs employed, and reported incidents of school safety issues. This data played a crucial role in triangulating and confirming the accuracy of the information presented about the districts. The final element of the data collection strategy was a review of school district policies, processes, and public records related to suspensions, expulsions, disciplinary practices, and SROs. We reviewed these records after conducting participant interviews and examining NCES data. Through this strategy, we were able to verify responses from participants.

Data Analysis

Interviews were recorded, transcribed, and coded. As the data were collected, we applied open coding with short words or phrases (Merriam & Tisdell, 2016). Data was analyzed utilizing the constant comparative method (Merriam & Tisdell, 2016). Categories that emerged from the data included demographics, leadership styles, enrollment, disciplinary strategies, and decision-making processes. Through the analysis process, the researchers employed a comprehensive analytic approach to derive valuable findings and meaningful interpretations from the research (Bingham, 2023).

The data analyzed in this study were obtained directly from the interviews and supplemented by information from the Ohio Department of Education. Data from the Ohio Department of Education provided additional context, offering valuable information about the realities faced in urban versus suburban schools. This approach ensured a better understanding when comparing and contrasting the responses of school administrators.

Validity and Reliability

The researchers employed triangulation to increase the reliability of the findings of this study. Data and characterizations provided by participants in the semi-structured interviews were validated by the aforementioned review of external databases including IES as well as data from the Ohio Department of Education. The researchers also employed peer debriefing during the data collection and analysis process. The researchers constantly reviewed data, seeking to confirm and challenge the interpretation of data and confirmation of research findings. Peer debriefing is a tool that can increase the validity of research findings (Spall, 1998).

Research Results

Three key findings emerged from the interview data in this study of urban and suburban education administrators' decision-making regarding whether to add, maintain, or eliminate SROs.

First, students' physical safety and mental well-being were of paramount concern for Midwestern school district administrators as they made these decisions. They prioritized creating secure learning environments where students could thrive without fear.

Second, some administrators, in making decisions about SROs, were acutely aware of the potential for emotional triggers in their students and communities, given the presence of SROs in their schools. These emotional triggers encompassed a range of responses, including increased incidents of violence in schools, community outrage, and legal action. Each of these had the potential to harm students' emotional well-being and negatively impact their school performance.

Third, cost factors were an essential consideration in administrators' decision-making processes to eliminate or maintain SROs. School district administrators, as they attempted to

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meet the safety needs of their students, felt an obligation to weigh the financial implications of eliminating or maintaining SROs. The urban schools in this study reported needing to navigate meager budgets when marking decisions about SRO staffing. Suburban schools, while considering the financial implications associated with SROs, did not report budget constraints in the same way as their urban counterparts. Table 3 presents the interview findings, themes, and interview results.

Table 3
Interview Findings Summary

Key Findings	Themes	Interview Data Summary
Safety and Well-being of Students	Physical Safety	School district administrators reported the importance of students' sense of safety
	Mental well-being	School district administrators reported the importance of students' sense of mental well-being
Avoiding Emotional Triggers for Students	Emotional well-being	Stressors for students
	Impact on school performance	Interferes with the student's ability to learn
Cost Factors	Budget constraints	SROs eliminated due to budget restraints
	Resource allocations	Resources with local police and grants

Safety and Well-being of Students

In deciding to add, eliminate, or maintain SROs, the dual focus of Midwestern school district administrators on the presence of SROs as enhancing students' physical safety and mental well-being, while also triggering emotional responses that potentially interfere with students' emotional well-being and school performance, may appear contradictory. On one hand, this study showed that the presence of SROs, particularly in urban schools, contributed to students feeling uncomfortable and fearful. On the other hand, school district administrators saw SROs as key contributors to shaping safe and secure learning environments. The awareness of SROs as a kind of "double-edged sword" was characteristic of participants in the study.

A more subtle understanding emerged as we examined urban schools with lower academic ratings and more diverse demographics from the Department of Education (2021) compared to their suburban counterparts. The Urban schools in this study perceived they were faced with heightened safety concerns compared to suburban schools, so the responsibility of administrators to address students' basic physiological and safety needs was heightened. In urban schools, resource officers were hired to create secure learning environments, laying the foundations for students to focus on their education and overall well-being. However, urban administrators also reported that students may experience emotional triggers in response to the presence of SROs within their educational environment.

Another aspect of Safety and Well-being recognized the practical aspects of implementing SROs. In partnership with SROs, some administrators strategically navigated cost factors to ensure the feasibility and sustainability of SROs. This involved exploring cost-effective alternatives, such as seeking external funding sources and engaging in community partnerships to mitigate financial burdens on the school districts while still prioritizing the safety and well-being of students.

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School district administrators considered student safety and well-being as primary factors in their decision to add an SRO. Although they recognized the potential benefits of having an SRO, such as providing immediate responses to emergencies and deterring criminal activities, administrators did not conduct a comprehensive review of the current security environment. Rather, their decision was primarily based on the assumption that having an SRO would enhance the overall well-being of students. They did not extensively analyze incident reports, engage in detailed discussions with local law enforcement, or examine evidence about SROs from other districts. Rather, the decision to add or maintain an SRO was driven by a general perception that the presence of an SRO would create a safer and more supportive learning environment, directly contributing to student well-being and performance. Administrators also considered feedback from teachers and parents, reinforcing the belief that an SRO would positively impact the school climate. The administrators themselves perceived that their district's parents supported SROs. Suburban School Administrator A confided:

> It is what our community wanted. When things happen nationally, the reaction from our families and others, we have to ask ourselves, what are we going to do in order to make our schools safer? There is a perception that having additional law enforcement in the building can help make people safer.

The conversation ended, punctuated by a solemn, monotone voice from Suburban Administrator A, "If there were no school shootings, we would not need SROs." Suburban Administrator A summarized that security, financial considerations, and perception were the driving factors behind the decision to add SROs.

"Success" is how Urban School Administrator A described the utilization of the SRO that had worked there even before Administrator A was employed. The terms, sad and crying, were used to describe the SRO's departure as the news spread of their recent promotion. The collaborative efforts described by Administrator A and the SRO were remarkably successful and grew into a professional friendship due to the respect each of them had for their profession and most of all for putting the students in the district first. The students felt a sense of comfort as the SRO sat with them at lunch and built a rapport with their families. When asked to describe the students' perspective of SROs, Urban School Administrator A did not hesitate and replied, "Trustworthy, protector, safe."

According to Suburban School Administrator B, the SRO has proved to be highly effective, even in handling seemingly minor tasks such as managing traffic during morning hours. Their presence outside the middle school ensured smooth traffic flow, allowing buses to depart promptly, and ensuring students arrived on time. Inside the elementary school, the SROs engaged in conversations with students, fostering positive relationships. Suburban Administrator B's voice overflowed with delight as they exclaimed:

> They're high-fiving them, it's adorable! They're building that relationship at a young age. The students think this is school and they're interacting with me in a positive way. That's been helpful. Then, they are like, okay. And at our high school and our middle school, we also see the advantage of them if we're needed if a student has an issue.

Additionally, Suburban School Administrator B highlighted another advantage of having SROs in the building: the opportunity for parents to file police reports on school premises. It eliminated the need for parents to reach out to external authorities and offered them a sense of safety and familiarity. Overall, the presence of SROs has had a profoundly positive impact on the community, as noted by Suburban School Administrator B during the interview.

Suburban School Administrator D provided one particularly poignant data point. Suburban Administrator D explained that the reason for her return from retirement was due

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to her former district had experienced a devastating mass shooting. Tragically, the incident resulted in the loss of four students and left seven others wounded, with one teacher sustaining injuries during the shooting event. In response, the school administration collectively decided to intensify school security measures. The district added SROs across the 10 buildings throughout the district. Suburban School Administrator D shared the tragic incident, softly stating the impact, "We doubled our school resource officers, doubled our security, doubled our efforts around everything." The ripple effects of the tragedy resulted in a decline in district enrollment. The district superintendent, who was present during the shooting, elected to end his career due to the personal trauma associated with the event.

Suburban School Administrator C voiced that there was no need for SROs, so the decision was not to add SROs. Suburban School Administrator C confirmed, "We don't make decisions without data to support it and are committed to looking at our data to justify why we might do it." The decision to not add SROs was supported by the data, even though there may be a perceived pressure on school administrators to have an SRO. Additional specific comments were made that adding SROs would cause more of a negative impact and harm to students' safety and well-being. The interviewee stressed that every decision the district made was data-driven and represented the district's commitment to basing its choices and strategies on information and evidence to achieve school safety.

Suburban School Administrator C said that the school district never hired SROs. The depth of this interview was interesting as their input shed light on the collaborative efforts between board members and the community. By incorporating their concerns as one factor, they decided that SROs were deemed unnecessary based on data, and their alternative approach would affect the school district's sense of security and overall well-being.

Suburban School Administrator C ensured that decisions were not made in the absence of supporting data, emphasizing the importance of evidence-based decision-making in their governance. They recognize the significance of relying on data-driving insights to shape policies and prioritize the safety and well-being of their students. Suburban School Administrator C indicated, "Our very own data told us that our students of color were disproportionately disciplined for the same or similar infractions as their White counterparts." It was further stated by Suburban School Administrator C, "And our numbers are telling us this is not the direction we need to go." Therefore, the Board of Education was committed to making informed decisions that align with their commitment to student well-being through data-driven decision-making for school safety measures, along with open communications with city officials and the local Police Department.

Suburban School Administrator D agreed with Suburban School Administrator C but emphasized the well-being of students as a top priority in decision-making stating, "We've also increased both quality and the quantity of other security services in addition to SROs and we have installed or are about to install seven days a week 24 hours a day Artificial Intelligence (AI) to check for weapons and other critical events." The conversation continued that the school district will be the first in the state to utilize a new form of AI. Suburban School Administrator D added, "AI can detect weapons through clothing, and pick up audio surveillance of a gunshot. We will know the decibels of a gunshot versus a firecracker. It surveys the perimeter and interior of the building, seven days a week, 24 hours a day." Suburban School Administrator D stated that students feel SROs are, "Friendly, trustworthy, and safe." The administrator acknowledged that there are not enough SROs to cover an entire district and emphasized the need for increased staffing to ensure that all schools benefit from the presence of SROs. While SROs are highly valued, this administrator believed that expanding SRO presence would strengthen the overall sense of security and support for students.

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Avoiding Emotional Triggers for Students

A perspective from Urban School Administrator B confirmed that when deciding to add or eliminate, the board of education had to step back and re-evaluate what was best for the district along with the police department, which was also undergoing budgetary issues. More importantly, Urban School Administrator B confirmed, "SROs were causing trauma and triggers [in students], regardless of who the police officer was, it was just that [their] presence." Consequently, the perceptions of SROs shifted negatively, despite any prior mentorship students had experienced. For these reasons, the urban school district eliminated SROs as documented in this case study.

Suburban School Administrator E monitored a thriving educational institution with a student population of 3,600 students, with the expectation of continued enrollment increases. Supporting their commitment to academic excellence, this institution has garnered unparalleled recognition, receiving a flawless five out of five-star rating from the Department of Education, the highest attainable accolade in the state. Suburban School Administrator E described the students' perception of SROs, "Our students love our SRO. He was nominated to be Pie in the Face this year, which is a big thing in our schools. We have a really good relationship with our school resource officer."

The researcher and school District administrator further engaged in a discussion regarding the effectiveness of SROs. The school administrator admitted, "If the person that is the SRO wants to be there and is there for kids, their position can be effective; but if it's just a patrol cop coming in to be an SRO by force because their captain told them, I feel that it is not effective."

Urban School Administrator C, from the largest school district in a Midwestern state, shed light on the diverse relationships between students and SROs within the school environment. To a portion of students, SROs served as positive role models and sources of support, fostering a sense of safety and trust within the school community. These students appreciated the presence of SROs as a means of promoting a secure learning environment. As Urban School Administrator C acknowledged there was "No one tool fix" in the decision-making process that needed to be addressed for the students in the district.

Moreover, Urban School Administrator C shared, "Other students, they're seen as a trigger, they're seen as unsupported." These students and their families have expressed their concerns due to events that unfolded in the media. Subsequently, the Board of Education eliminated SROs because they recognized students felt SROs were triggers and training for cultural competency needed to be established. Urban School Administrator C believed that if a student safety council were established, the students would have input in creating a safe environment, ensuring their voices were heard on school safety.

Underscoring the different realities at work between the urban and suburban districts in this sample, Urban School District Administrator D revealed, "Most kids in urban cities have negative thoughts that are bad about SROs. They think, they just want to throw Daddy back in jail."

Emotional triggers did not become evident to the administrators until SROs were already in place, leading school district administrators to reconsider their decision to retain them. Initially, the presence of SROs was intended to enhance school safety and foster positive relationships between students and law enforcement. However, over time, concerns emerged from students and the community about the negative emotional impact of having SROs in schools. Many students, particularly those from marginalized communities, reported feeling targeted or intimidated, which led to increased stress and anxiety.

The voices of students and feedback from the broader community highlighted that the presence of SROs was causing emotional distress and negatively affecting the school environment. Parents and community members expressed concerns about the psychological

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impact on students, pointing out that the presence of law enforcement officers could make students feel criminalized for minor infractions. In response to concerns about the emotional distress and negative effects within the school environment, administrators decided to eliminate the SRO positions. The focus shifted towards eliminating the positions without providing alternative strategies.

Cost Factors

Another reason midwestern school district administrators decided to eliminate SROs was because SROs presented a financial burden on the school district as their pay often came directly from the school district's budget. Urban School Administrator D was asked why they eliminated SROs; the immediate reply was "Cost."

The decision to eliminate or maintain SROs varied between urban and suburban school districts due to contrasting financial circumstances. Urban districts faced cost restraints, which influenced their decision to eliminate SRO positions. The financial limitations stemmed from budget constraints and a lack of additional funding sources. In contrast, suburban districts did not face the same financial limitations, mostly due to greater flexibility associated with generating higher dollars from local property taxes as well as access to safe school grants. While the urban districts in this sample had higher per-pupil spending, a much greater portion of this funding was federal in nature, tied to specific activities and programs that could not be spent on SROs. Consequently, the suburban districts in this sample were able to maintain SRO positions without significant financial strain. The disparity in financial resources played a crucial role in shaping the decisions of urban and suburban school administrators regarding the presence of SROs in their respective districts.

Unlike urban school districts, suburban schools have more flexibility in allocating budgets across different expense categories. Suburban School Administrator F proudly stated, "As cost is not a limiting factor, the school district can prioritize safety to a greater extent, resulting in a safer environment for all. Through a partnership with the local police department, the district successfully maintained multiple full-time SROs." This administrator emphasized that SROs were "an incredible deal" financially for his district.

Summary of Key Findings

This case study reveals why Midwestern school district administrators add, eliminate, or maintain SROs. This case study found that factors influencing decisions about SROs pertain to safety & well-being for students, triggers for students, and cost factors. The categories themselves came into play at different times, with administrators weighing different factors when deciding whether to add, eliminate, or maintain SROs as demonstrated in Table 4.

Table 4
Summary of Key Findings

	How do Midwestern School District Administrators Decide How to Add SROs?	How do Midwestern School District Administrators Decide How to Eliminate SROs?	How do Midwestern School District Administrators Decide How to Maintain SROs?
Safety and Well-being for Students	X	X	
Students Emotional Triggers		X	
Cost Factors		X	X

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Discussion

In this study, the research revealed that local administrators had various justifications for deciding to add, eliminate, or maintain SROs. The school administrators in this study added SROs to increase students' safety and well-being. The school administrators in this study considered cost factors in deciding whether to maintain their SROs. Justifying the decision to eliminate SROs was more complicated.

While the direction of American public policy has tended to see SROs as the primary policy solution to the problem of school violence, the findings in this study suggest that administrators in the local bureaucracy play an essential role in facilitating or stopping policy initiatives or movements from above. Although it is clear that a policy window has been created to introduce more SROs in US schools, administrators at local levels make a variety of decisions in practice. Some administrators in this study decreased SRO presence in their schools. It is important to fully flesh out why, in the face of an overwhelming movement to increase SROs, some administrators are choosing the opposite path.

Student well-being was one key justification for the decision to eliminate an SRO. Because the presence of SROs is intended to increase student safety, the justification of student well-being for adding an SRO is self-explanatory; however, the administrators in this sample also indicated that student well-being was a consideration in their decision to eliminate SROs. The administrators who eliminated SROs in this study were located in urban districts. They indicated that the mere presence of law enforcement officers in the school made students feel less safe due to difficult or traumatic past interactions with police. While the administrators framed this decision to eliminate the SRO in terms of "Student Well-Being," it was also tied to what they perceived as emotional triggers. For these administrators, emotional triggers were not considered or did not become evident until SROs were already in place at the school site. Emotional triggers, while closely related to student well-being, are a distinct finding as one or a few students' emotional triggers do not constitute a general lack of well-being. What the urban administrators in our sample described, however, were many individual emotional triggers that then constituted an environment that was perceived as being unsafe due to the presence of SROs.

In addition to considering emotional triggers and student well-being, a significant part of the decision to eliminate SROs in urban schools is related to financial constraints. These districts faced a much different financial environment compared to suburban schools in the sample that had abundant resources. Urban districts faced budgetary pressures that compelled them to make difficult choices about allocating limited funds. SROs are expensive to maintain, involving not just salaries for officers but also health insurance and equipment costs. In contrast, suburban schools with greater resources found it easier to justify the expense of SROs.

This does not necessarily mean that suburban schools are immune to scrutiny regarding their use of SROs. Despite having relatively well-funded schools, some suburban districts may also reevaluate the role of law enforcement on school grounds considering alternative approaches to school safety that prioritize community engagement and mental health support over an SRO presence. Ultimately, both urban and suburban schools reported that they critically assessed the need for SROs weighing the costs against the potential benefits for student well-being and general safety.

The findings in this study both reflect and inform Kingdon's (2003) policy streams model by demonstrating the ability of bureaucratic decision-makers in a decentralized system to steer policymaking away from the overall direction of education policy. While the policy streams model can accurately explain the overall increase in SROs in schools, it does not fully account for decisions made contrary to policy proposals in a system where power is shared at various levels.

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Existing research confirms that the implementation of federal or national policies is often subject to the interpretation of local bureaucrats (Nugroho et. al., 2018). One view of this localization of knowledge might suggest that local school administrators serve a gatekeeping function, choosing to alternatively facilitate or stymie policy initiatives/incentives from above. In this interpretation, local school administrators are simply viewed as intransigently exercising power over their local schools, each holding the keys to a small kingdom.

A more credible interpretation of the findings in this study, however, accepts that the local situation in US schools is highly variable between urban and suburban schools. In the American context, federal policy or incentives wielded in education are clumsy and inexact tools to address even commonly agreed-upon problems such as school violence (Curran et al., 2019. In this view, the responsibility for the disconnect between the intent of federal policymakers and implementation at the local level lies with policymakers at the national level who failed to fully understand the variety of local conditions.

The participants in this study were neither seeking to facilitate or block national policies or incentives. The administrators in this study were attempting to address local safety concerns at their school sites in a way that increased the actual level of safety as well as the perceived level of safety which included avoiding emotional triggers on the part of their students, all while staying within a budget. The administrators in this case study were responding to local concerns and conditions. The participants were receptive and responsive to federal incentives to hire and maintain SROs, but they were not receptive to these incentives if they believed that the presence of an SRO would decrease students' sense of well-being or trigger negative emotional responses for their students.

Conclusions and Implications

This qualitative study of 10 American school administrators from the Midwest found that administrators considered the safety & well-being for students, triggers for students, and cost factors when making decisions about whether to add, maintain, or eliminate SROs in their schools. While the overall SRO presence continues to expand in American schools, there are exceptions. Due to power and funding being shared between federal, state, and local levels in the American education system, introducing or maintaining an SRO is not a foregone conclusion in every local school district. Local administrators continue to apply their knowledge of their own school populations and budgets in ways that result in a variety of policy outcomes driven by different rationales.

As policymakers in education systems worldwide plot how to implement sustainable development goals (SDGs) relating to providing sustainable and equitable educational opportunities, it is wise to consider that well-laid plans are subject to the local conditions, factors, and personalities in decentralized systems. In the United States, a safe school environment is a prerequisite to providing equitable educational opportunities. The participants in this study disagreed on the efficacy of the policy solution (SROs). This suggests that in order to move toward progress on SDGs in decentralized systems, it is important to have an understanding of the local context and thoroughly consider whether a given funding model will attain an acceptable level of policy compliance. A thorough understanding of local policies, concerns, and conditions increases the likelihood that policy proposals are implemented effectively and consistently.

Declaration of Interest

The authors declare no competing interest.

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INTEGRATING CULTURAL CREATIVITY AND INDUSTRY COURSES INTO SUSTAINABILITY PRACTICE

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Abstract

This study explored how cultural creativity courses can enhance university students' awareness of sustainability issues and inform the design of sustainable development practices aligned with local cultural values. A total of 75 university students participated in an 18-week general education course, with 50 valid responses analyzed through a mixed-methods approach. Quantitative data were collected via a semi-structured questionnaire, while qualitative data included reflections and interviews analyzed using thematic analysis.

The findings reveal that students developed significant insights into environmental, economic, and social sustainability dimensions through experiential activities, such as field visits and creative product designs. These results align with prior research on experiential learning, highlighting the importance of integrating cultural creativity into sustainability education. However, this study contributes a novel framework by demonstrating how localized, hands-on courses can foster community engagement and sustainable practices. This research provides implications for designing university curricula that address sustainability while preserving local cultural heritage. This study has addressed a gap in sustainability education literature by integrating cultural creativity and experiential learning. The creative outputs, such as cultural products designed by the students, reflected the integration of sustainability practices with local cultural heritage.

Keywords: *action research, cultural and creative industries, social practice, sustainable development goals (SDGs), university social responsibility (USR)*

Introduction

The term "Cultural and Creative Industry" is officially designated in Taiwan and differs from similar concepts in other countries. It is a combination of "Cultural Industries" and "Creative Industries." The Executive Yuan first defined this term in May 2002 as part of the sub-project "Development of Cultural and Creative Industries" under the "Challenge 2008: National Development Priority Plan." In January 2010, the Legislative Yuan passed the Cultural and Creative Industry Development Act. The Act's first article states: "This Act is formulated to promote the development of cultural and creative industries, construct a social environment rich in cultural and creative content, apply technology and innovation in research and development, foster talent cultivation in cultural and creative industries, and actively develop domestic and international markets. "The Ministry of Economic Affairs defines cultural and creative industries as industries that originate from creativity or cultural accumulation, create intellectual property, and have the potential to generate wealth and employment opportunities, thereby enhancing the overall living environment. Consequently, many universities in Taiwan have established courses related to cultural and creative industries to cultivate relevant talents and promote values such as enhancing the living environment.

Building upon this context, sustainability education has emerged as a critical approach to addressing global challenges, fostering environmental, economic, and social responsibility

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among students. Prior research, such as Chang and Hsu (2010), emphasizes the importance of experiential learning in promoting sustainability awareness. However, limited studies have explored the integration of cultural creativity into sustainability education to address local community issues, highlighting a gap in the existing literature.

Since 2022, the university involved in this study has participated in the National Science and Technology Council's "Humanity Innovation and Social Practice" project. This initiative integrates cultural and creative industry courses with university social responsibility (USR) practices to address local community issues. These courses emphasize applying creative thinking to real-world problems, transforming cultural and creative industries into actionable university social responsibility practices.

This study seeks to address this gap by exploring how cultural creativity courses can enhance students' understanding of sustainability issues and foster the design of sustainable development practices that align with local cultural values. The research contributes to sustainability education by providing a localized, hands-on framework that integrates cultural creativity with community engagement.

This study involved 75 university students enrolled in the general education course "Cultural Creativity and Industry," with 50 valid responses analyzed. The students who visited Haomei Village in Budai Township, Chiayi County, participated in community environmental sustainability action experiences to understand their awareness of community environmental issues.

Accordingly, the aim of this study was to explore how cultural creativity can enhance students' understanding of community sustainability issues and foster the design of sustainable development practices that align with local cultural values.

Research Focus

In recent years, the National Science and Technology Council in Taiwan proposed the "Humanity Innovation and Social Practice" project to emphasize the importance of rooting research in local contexts. This initiative asserts that "research in the humanities and social sciences must be rooted in local contexts with adequate resources and manpower, emphasizing social participation" (Hsieh, 2014). Similarly, the Ministry of Education's "University Social Responsibility (USR)" program encourages universities to engage systematically with local communities, identify critical issues, and offer practical solutions. Together, these initiatives have driven university courses to evolve into action-oriented programs focusing on sustainable development.

Literature Review

The Significance of the University General Education Course "Cultural Creativity and Industry"

The term "Cultural and Creative Industries" was first proposed in Taiwan, referring to industries that combine culture and creativity, with cultural uniqueness as the central core. These industries create value through content (including cultural accumulation and creativity), generating economic value (including emotional recognition, and enhancing the quality of life) (Cheng et al., 2009). The concept of cultural industries has been practiced abroad for many years, with its origins tracing back to the 1940s in sociology under the term "culture industry." Each sector and product of the culture industry was designed for mass consumption, produced according to plan, and to a considerable extent, determined the nature of consumption. Contemporary technological capabilities, along with economic and managerial centralization,

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have allowed this system to be seamlessly integrated, top-down, with its consumers (Chu, 2000), further exploring the concept of culture industries. Creative industries have been discussed as those based on creativity closely related to everyday life, encompassing culture, art, and entertainment with leisure value (Caves, 2000). According to Caves (2000), seven fundamental characteristics define creative industries: demand uncertainty, the importance of creative workers' commitment to their work, the need for diverse skills in creative products, product differentiation, vertically segmented skills, time sensitivity, and the durability of products and rents. Following the passage of the "Cultural and Creative Industry Development Act" in Taiwan in 2010, efforts have been made to actively cultivate relevant talents. However, definitions of cultural and creative industry professionals and talent vary among countries and scholars (Lee & Lin, 2011). In its *2009 UNESCO Framework for Cultural Statistics*, UNESCO further defined cultural work as encompassing creativity and artistic production, including the following: (1) the creation, development, preservation, or reflection of cultural and spiritual meanings or symbols; (2) the creation, production, and dissemination of cultural products and services protected by intellectual property rights; and (3) artistic expressions such as visual arts, music, writing, dance, or theatrical arts.

From the above, it is clear that the definition of cultural and creative industries is broad. Hence, Article 11, Section 2 of Taiwan's Cultural and Creative Industry Development Act explicitly states: "The government may assist local governments, universities, and cultural and creative enterprises in enriching cultural and creative talent, encourage the establishment of cultural and creative industry-related facilities, offer relevant courses, or conduct creative development, experimentation, creation, and performance." As a result, Taiwanese universities have actively offered relevant courses as part of higher education. As of June 2024, a total of 42 universities have offered 151 courses related to cultural and creative industries in the 2023-2024 academic year, highlighting the importance of cultural and creative industries in Taiwan's higher education.

Integrating "Social Practice" of "Environmental Imagery" into the "Cultural Creativity and Industry" Course

Next, the discussion on the formation of environmental imagery can be traced back to the 1970s with the introduction of "Behavioral Geography." This field is generally divided into two main parts: environmental perception and spatial behavior. Environmental perception focuses on the study of imagery, particularly how individuals imagine various elements within their environment, while spatial behavior emphasizes the actions that arise after the formation of these images (Lin, 1998). "Environmental perception" is closely related to the human-environment relationship, being an inseparable part of this relationship system (Chang, 1977). Perception is a more realistic and comprehensive description of human reactions to the environment, leading to the establishment of a framework for environmental perception and behavior. This framework specifically illustrates how the real world provides the necessary information for decision-making through sensory reception, filtered through value systems, which then forms environmental imagery, shaping the decision-making and behavioral processes (Downs, 1970). Based on the relationship between environment and behavior, the environment can be divided into four nested parts: the geographical environment, the operational environment, the perceptual environment, and the behavioral environment (Sonnenfeld, 1972).

However, the formation of environmental imagery through perception influences decision-making behavior. Social practice theory examines social phenomena by observing them, re-evaluating the relationships and reasons for changes between these phenomena, and thus reinterpreting social change in an innovative way (Elizabeth et al., 2012). Social innovation, in this context, is more specifically defined as actions taken by social actors in response to

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common needs and the desire to solve problems, aiming to change social relationships, alter the logic of actions, or propose new ways of defining and addressing problems (Bouchard, 2013). Therefore, when university students form an environmental imagery of a place, they can, through learning in the Cultural Creativity and Industry course, observe the phenomena and issues within local communities and propose innovative ideas and solutions. This process helps achieve the goal of social practice in local communities as part of the university's mission.

Strategies for Constructing "Sustainable Development" through "Cultural Creativity and Industry"

In 2016, the United Nations proposed the Sustainable Development Goals (SDGs), which define sustainable development through three main elements: environment, economy, and society. The intersection of these three areas represents what is "bearable," "viable," and "equitable," with the core intersection being "sustainable development" itself (United Nations, 2014). The SDGs comprise 17 goals and 169 specific targets. Among them, SDGs 11, "Sustainable Cities and Communities," emphasizes that urban and rural areas should have positively interconnected planning and development in economic, social, and environmental aspects. Education for sustainable development brings a new impetus to learning, empowering students to develop and evaluate a sustainable future and work collaboratively towards this goal (Chang & Hsu, 2010). When education integrates the United Nations' sustainable development agenda, it encourages students to think critically about related issues within the context of the SDGs, further fostering their ideas and viewpoints while developing critical thinking and analytical skills. Therefore, education becomes a crucial element in sustainable development (Lee, 2023). Through education, students can learn to respect social and cultural diversity and understand issues related to the Earth's environment (Carnoy & Castells, 2001). University students can explore and plan for various issues within local communities. Similarly, the Cultural Creativity and Industry course primarily cultivates students' creative thinking abilities, helping local communities find solutions to their issues, thereby implementing sustainable development.

Research Framework

Building upon the reviewed literature, this study addresses a key gap in understanding how cultural creativity can effectively integrate sustainability into community practices. While previous research has emphasized the importance of cultural and creative industries in enhancing the living environment, few studies have explored how these principles can be applied to improve community sustainability through university courses.

The aim of this research was to examine how cultural and creative industry courses could be integrated into university social responsibility practices and applied to address local community issues. This study involved 75 university students, with 50 valid responses analyzed, to assess students' awareness of community sustainability issues and their ability to design sustainable practices aligned with local cultural values.

Research Questions:

1. How can cultural creativity enhance students' awareness of community sustainability issues?
2. What sustainable development practices can be designed to align with local cultural values?

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Research Methodology

Background

This study utilized action research, integrating practical engagement with systematic inquiry (Tsai, 2000). Kemmis (1988) described action research as part of the "reconceptualization of educational research," highlighting the active role of practitioners in problem identification, methodological exploration, and knowledge generation. Elliott (1991) emphasized the key distinctions between action research and traditional research, particularly the difference between internal and external values in practice. Internal values focus on individual growth and learning, whereas external values evaluate whether objectives are achieved.

The action research in this study involved two phases, designed to guide university students in exploring "internal practice values" related to local culture and environmental ecology. The first phase, conducted from February to March 2024, focused on foundational coursework in cultural creativity, equipping students with the knowledge and skills necessary to understand and engage with cultural and environmental themes. The second phase, carried out from April to June 2024, emphasized the development of environmental imagery, which students used as a foundation for creating innovative products that reflect local culture and sustainability principles. This framework, implemented during the 18-week course in the spring semester of 2024, not only fostered individual growth but also promoted community-based outcomes through cultural and creative educational practices.

Design

The primary teaching objective of the "Cultural Creativity and Industry" course is to train students in using local cultural resources and design elements, applying "biomimicry" principles to discover local characteristics, create value, and develop product design skills. The course addresses the gap in practical case integration in general education, using environmental issues as a core theme, combined with hands-on teaching to connect academic knowledge with community needs:

1. Step One: Establishing Course Framework

The 18-week course dedicates 4 weeks to field visits in Haomei Village, where students identify unique community features and propose cultural product designs focusing on sustainability. The course framework is visually illustrated in Figure 1, which details the structure of the course, including theoretical foundations, group reflections, research methods, local issue analysis, community visits, and creative design proposals. This visual representation helps demonstrate the logical flow from theoretical learning to hands-on practice, culminating in feedback and reflection activities that enhance students' understanding of local cultural and sustainability issues.

2. Step Two: Securing University Support

Funding from university projects supported transportation, meals, activities, and the hiring of a teaching assistant, ensuring off-campus visits were feasible.

3. Step Three: Planning Environmental Imagery

Initial analysis of Haomei Village included literature collection, on-site observations, and community input. Teaching focused on 12 key themes of environmental imagery, where students engaged in community visits and sustainability actions. Interviews with residents enriched students' understanding of the village's culture, ecology, and sustainability challenges.

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An environmental imagery preference questionnaire was also administered, with responses summarized in Table 1, which helped deepen their understanding and enhance their capacity to design products that reflect local characteristics.

Figure 1
Course Structure Diagram

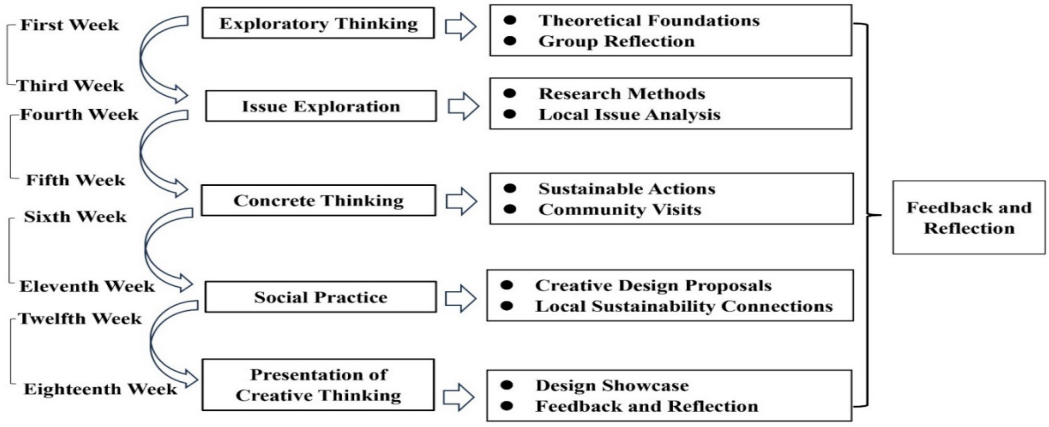

Table 1
Haomei Village Environmental Imagery in Course Planning

Environmental Imagery	Characteristics and Origins of the Imagery	Potential Informants
Wanckan Tai-seng Temple	Community Religious Center, a Temple Dedicated to Matsu.	Temple Administrator
Matsu Statue from the Ming Dynasty	The Oldest Existing Matsu Statue in Taiwan, Enshrined at Tai-seng Temple.	Temple Administrator
Gak-tau Temples	Community Temple Branches, with a Total of Four Gak-tau Temples	Temple Administrator
Wu-Ying Army	The Wu-Ying Army are the Protectors of the Village. Due to Haomei Village's proximity to the sea, they are shaped like tall towers.	Temple Administrator
3D painted murals	In 2015, it became Taiwan's first 3D painted fishing village, with the murals created by artist Tseng Jin-Cheng.	Haomei Boat House (Haomei Agriculture and Fishery)
Jia-Hao Ecological Park	The windbreak forest within the community is a collaborative site between National Chiayi University and the Haomei Village community.	Local Residents
Abandoned Salt Fields	Once an important industry during the Japanese colonial period, the site is now abandoned.	Local Residents
Fish Ponds	One of the main industries in the community, focused on the aquaculture of clams, white shrimp, and milkfish.	Local Residents
Oyster Industry	One of the community's industries includes oyster farming, shucking oysters, collecting oyster shells, and making oyster fritters.	Local Residents

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Environmental Imagery	Characteristics and Origins of the Imagery	Potential Informants
Egg Chicken Farms	One of the community's industries, with chicken farms primarily focused on egg production.	Chairperson of Haomei Village Community Development Association
1920 Haomei Bao'an Forest	The Haomei Village windbreak forest, is renowned for its ecological engineering methods, including trenching and dike construction.	Local Residents
Haomeiliao Nature Reserve	The coastal sandy terrain of Haomei Village once saw its beach eroded away. Local residents restored the beach area by using sand-blocking fences. This location is also a popular spot for taking "Mirror of the Sky" photos, favored by social media influencers.	Haomei Boat House (Haomei Agriculture and Fishery). Local Residents

4. Step Four: Constructing Community Imagery

Using SPSS, students analyzed data from the environmental imagery questionnaire, which helped shape a unique community imagery for Haomei Village.

5. Step Five: Linking Products to Sustainability

In line with the United Nations Sustainable Development Goals (SDGs), particularly SDG 11 on sustainable cities, this step ensured that student-designed cultural products aligned with Haomei's sustainability themes. After the visits, students completed a questionnaire with items related to environmental, economic, and social aspects of sustainability (see Table 2). The SPSS analysis identified students' perspectives on local sustainability, showing their preference for integrating sustainable practices into cultural product design. Table 2 presents a summary of the students' responses, highlighting their thoughts on how cultural creativity can contribute to the sustainability of Haomei Village.

Table 2

Sustainable Development Items for Haomei Village

Sustainability Dimension	Questionnaire Items	Problem Awareness
Environment	The natural scenery of Haomei Village is beautiful and unique.	The area has a national-level wetland and abundant natural ecology.
	The cultural landscape of Haomei Village is rich in history and distinct.	The area has a 400-year history of cultural heritage.
Economy	The level of commercialization in Haomei Village is low.	The area's original industrial and economic activities.
	There are few tourists in Haomei Village, resulting in a low level of crowding.	The economic status of the tourism industry.
Society	The community atmosphere in Haomei Village is warm, friendly, and feels comfortable and relaxing.	The social relationships among community residents.
	Tourism information and public service facilities in Haomei Village are adequate.	The relationship between public agencies and the community.

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Participants

This study involved 75 students enrolled in an 18-week general education course titled "Cultural Creativity and Industry," offered at a university in Taiwan. The participants represented diverse academic backgrounds, including the Teachers College, College of Humanities and Arts (28%), College of Life Sciences, College of Agriculture, and College of Science and Engineering. Most participants were sophomores, with representation from other academic years as well.

However, among the 75 participants, data were collected from 50 valid responses (67% response rate), which is lower than initially expected. This smaller-than-expected sample size could potentially affect the generalizability of the findings. Despite this limitation, the data collected provide valuable insights into students' perceptions of sustainability and cultural creativity practices.

The demographic details of the respondents are summarized in Table 3. The majority (64%) were male, aged under 20 (66%), and predominantly first-year students (48%). Furthermore, 76% of the participants visited Haomei Village for the first time. The research was conducted in Haomei Village, Budai Township, Chiayi County, Taiwan, known for its rich cultural heritage and natural attractions, such as Tai-seng Temple and the NO.1920 Haomei Bao'an Forest.

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of National Chiayi University. All participants provided informed consent prior to the study, ensuring voluntary participation, anonymity, and confidentiality of the data collected.

Table 3
Table of Personal Attributes Data

Respondents' Basic Information		Sample (people)	Percentage (%)
Gender	Male	32	64
	Female	18	36
Age	Under 20 years old	33	66
	21-30 years old	17	34
Department/College	teachers College	14	28
	College of Humanities and Arts	14	28
	College of Science and Engineering	7	14
	College of Agriculture	9	18
	College of Life Sciences	6	12
Grade	First-year student	24	48
	Second-year student	14	28
	Third-year student	3	6
	Fourth/final-year student	8	16
	Other	1	2
Place of Residence	Northern Taiwan	11	22
	Central Taiwan	18	36
	Southern Taiwan	20	40
	Other	1	2
Have you visited Haomei Village before?	Yes	12	24
	No	38	76

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Instrument and Procedures

This study employed a combination of quantitative and qualitative methods to comprehensively assess the sustainability practices integrated into the cultural creativity and industry courses.

To collect quantitative data, a semi-structured questionnaire was designed to assess students' perceptions of environmental imagery and the three pillars of sustainability—environmental, economic, and social. The questionnaire included 18 items rated on a 5-point Likert scale. Its reliability was confirmed with Cronbach's alpha values ranging from .70 to .98. Expert validity was evaluated by three university professors specializing in environmental education, cultural studies, and sustainable development, who reviewed the questionnaire for relevance, clarity, and coverage. This process resulted in a content validity index (CVI) of .88. After the experiential activities, the questionnaire was administered online to 75 participants, resulting in 50 valid responses, representing a response rate of 67%.

Qualitative data were collected through 300-word student reflections and 30-minute group interviews. Reflections were analyzed via open coding to gain insights into students' creative processes and sustainability integration.

Data Analysis

Quantitative data were analyzed using descriptive statistics in SPSS to summarize participants' responses and identify trends related to environmental imagery and the three pillars of sustainability (environmental, economic, and social). This approach was chosen to provide a clear overview of central tendencies (e.g., means, medians) and variability (e.g., standard deviations) in the data, enabling an understanding of general patterns in students' perceptions. Initially, 75 students were invited to participate in the study; however, only 50 valid responses were collected, yielding a response rate of 67%. This smaller-than-expected sample size may influence the generalizability of the findings. Despite this limitation, the data collected still provide valuable insights into students' perceptions of sustainability and cultural creativity.

Qualitative data, including reflections, interviews, and observational notes, were analyzed using thematic analysis, following the six-step framework outlined by Braun and Clarke (2006). This method was chosen for its flexibility and ability to capture nuanced patterns of meaning in participants' experiences.

The thematic analysis involved the following steps:

1. Data Familiarization: All qualitative data were read multiple times to gain a comprehensive understanding.
2. Generating Initial Codes: Data were systematically coded to identify meaningful segments and recurring patterns.
3. Searching for Themes: Codes were grouped into overarching themes such as "cultural awareness," "environmental responsibility," and "design innovation."
4. Reviewing Themes: Themes were refined to ensure alignment with the research objectives and accurately represent the data.
5. Defining and Naming Themes: Clear definitions were assigned to each theme to ensure consistency.
6. Writing Up: Themes were synthesized into a cohesive narrative to provide actionable insights.

The choice of thematic analysis over content analysis was based on the study's exploratory nature, which aimed to understand the depth and complexity of students' reflections and their engagement with sustainability principles.

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Research Results

Quantitative Findings: Perceptions of Community Environmental Imagery

The quantitative analysis explored students' perceptions of sustainability, including environmental, social, and economic dimensions. The results provided insights into their understanding of community environmental imagery and its alignment with sustainability principles.

The analysis results of the collected questionnaires are presented in Table 4. It was found that after the students' visits and experiential activities, the most preferred environmental imagery of Haomei Village was the "1920 Haomei Bao'an Forest." In addition to the visits, the course also arranged for students to participate in a hands-on sustainability activity involving sand-blocking fences at the Haomeiliao National Wetland. Due to this practical experience, the " Haomeiliao Nature Reserve" ranked second in environmental imagery preference. Additionally, Haomei Village gained significant popularity in 2015 as Taiwan's first 3D painted fishing village, quickly becoming a hot tourist spot. As a result, the "3D Painted Fishing Village" imagery ranked third and left a strong impression on the students. However, the students were less responsive to local industries such as fish ponds, egg chicken farming, and salt production, resulting in weaker industrial environmental imagery.

From the construction of Haomei Village's environmental imagery, it is evident that students were more focused on issues related to the natural environment and ecology. This preference aligns with the concept of environmental sustainability, which is one of the three dimensions of sustainable development. The following sections will analyze the sustainability dimension of the questionnaire, student reflections, and the creative thinking behind cultural and creative products to explore students' comprehensive views on sustainable development.

Table 4
Environmental Imagery Preference Analysis

Environmental Imagery	*M*	*SD*	Rank	Overall *M*
Wanckan Tai-seng Temple	4.02	0.50	5	
Matsu Statue from the Ming Dynasty	4.04	0.42	4	
Gak-tau Temples	3.74	0.60	9	
Wu-Ying Army	3.70	0.55	10	
3D painted murals	4.10	0.33	3	
Jia-Hao Ecological Park	3.90	0.45	7	
Abandoned Salt Fields	3.62	0.70	11	
Fish Ponds	3.84	0.52	8	3.92
Oyster Industry	3.92	0.48	6	
Egg Chicken Farms	3.40	0.80	12	
1920 Haomei Bao'an Forest	4.40	0.30	1	
Haomeiliao Nature Reserve	4.34	0.25	2	

Qualitative Insights: Integrating Sustainable Development into Cultural Creativity

The qualitative findings revealed themes such as cultural awareness, environmental responsibility, and creative innovation. These insights highlighted how the Cultural Creativity and Industry course fostered the integration of sustainable development into practical community-based learning.

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This learning process is both authentic and meaningful, providing a robust teaching experience. To clarify students' thoughts on sustainable development, this study utilized various sources, including student questionnaires completed after visits, student reflections, group project design concepts, and design interviews. The results are summarized as follows:

1. *The Implementation of the "Environmental Sustainability" Dimension in the Cultural Creativity and Industry Course*

Based on the results of the questionnaires completed after the visits, the items related to environmental sustainability were divided into natural environment and cultural landscape categories. The average scores for these items are shown in Table 5. The data indicate that students had a stronger impression of the natural environment, which aligns with their preference for the natural environmental imagery of Haomei Village, as mentioned earlier. In their reflections after visiting the community, students expressed a deeper appreciation for the local natural environment and environmental sustainability actions. After open coding the students' reflections, key terms related to environmental sustainability and the natural environment were identified and summarized as follows:

> For me, the most distinctive feature of Haomei Village is the windbreak forest. Whether it's the Haomei Bao'an Forest that connects to the beach or the small windbreak forest outside the activity center, I feel that it not only represents the effort everyone has put into environmental restoration but also symbolizes the deep connection between the local residents and the land. (S-3-601)

> My favorite part of Haomei Village was the beach and the windbreak forest area we visited that day. Although the weather was extremely hot, walking in the shaded windbreak forest felt like a different experience altogether. It gave me a sense of mystery and beauty, and as I watched the swaying branches and leaves, I felt my mood relax as well. (S-2-203)

> Haomei Village Beach is the result of the relentless efforts of the local residents, who painstakingly erected sand fences and planted sand-fixing vegetation to create what is now the 'Mirror of the Sky.' The residents, driven by the need to protect clams from sand intrusion, environmental conservation, and the preservation of this beautiful landscape, have collectively fostered the concept of sustainable development. (S-5-401)
> I really liked the beach at Haomei Village. The sand there is so fine that even if it gets into your shoes, you hardly notice it. Additionally, the planting of beach morning glory and the beach cleanup efforts show how much care has been put into preserving this beach. (S-2-301)

Table 5
Students' Impressions and Perceptions of Environmental Sustainability in Haomei Village

Questionnaire Item	*M*	*SD*
The natural scenery of Haomei Village is beautiful and unique.	4.14	0.50
The cultural landscape of Haomei Village is rich in history and distinct.	3.84	0.55

Certainly, some students preferred the cultural and historical aspects more. Since students came from different academic disciplines, their perceptions of the environment varied. The key terms related to culture and history were identified and summarized as follows:

> The cultural and historical landscape of this place is also very captivating to me. Many of the towers here, which I had never seen before, serve as landmarks, each dedicated to different deities. These are the faith stories unique to the local people. There are also many temples, which highlights the importance of religion to the fishing village residents, who have long relied on the sea for their livelihood. (S-5-302)

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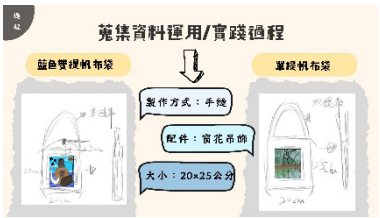
> Through the visit, I gained a deeper understanding of Haomei Village's temple culture and its many painted landmarks. The elevated Five Camps (Wu-ying army) associated with the local temples were particularly intriguing. During the visit to Taiseng Temple, I was surprised to find that, in addition to enshrining the Ming Dynasty Matsu, the temple also worships other deities, highlighting the uniqueness and long history of Tai-seng Temple. (S-3-204)

The results of this course study indicate that students had a profound experience in the visited areas, which also provided them with opportunities to explore local issues and generate creative inspiration. The explanations of each group's creative concepts (as shown in Table 6) reveal how students addressed their concerns about environmental sustainability by producing practical works.

Table 6

Explanation of Students' Group Cultural and Creative Products and Environmental Sustainability Concepts

Physical Presentation of Cultural and Creative Products and Design Process	Explanation of Creative Concept
 Design Process  	1. **Production Theme**: **Wanckan Mazu Blessing Canvas Bag** 2. **Design Concept**: The Wanckan Tai-seng Temple Mazu, the aquaculture industry, and the Casuarina windbreak forest are significant local features and cultural symbols of Haomei Village. These elements embody the essence of the community, allowing visitors to leave with a lasting impression of Haomei Village. 3. **Sustainable Development Goal 12**: The focus on responsible consumption and production is reflected in the choice of materials for this product, which are made from recycled waste, thereby contributing to environmental sustainability.

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Physical Presentation of Cultural and Creative Products and Design Process	Explanation of Creative Concept
 Design Process 	1. **Production Theme**: **Haomei Village Landscape Feature Calendar** 2. **Design Concept**: To promote the unique characteristics of Haomei Village, a calendar with continuous imagery was chosen as the product. This allows visitors to gain a deeper understanding of Haomei Village while preserving fond memories. 3. **Sustainable Development Goal 11**: **Sustainable Cities and Communities**: By creating and sharing this cultural and creative product, the aim is to enhance the connection between urban, suburban, and rural areas, especially in lesser-known regions like Haomei Village.

2. *The Implementation of the "Economic Sustainability" Dimension in the Cultural Creativity and Industry Course*

Regarding the aspect of economic sustainability, it was the part that left the most profound impression on the students. Haomei Village, located on the southwestern coast of Chiayi County, is considered a rural area within the county, resulting in a relatively low level of economic prosperity. This observation is also reflected in the students' questionnaire results (as shown in Table 7), where they noted that Haomei Village has a low number of tourists and a low degree of commercialization. After visiting the community, students' reflections revealed an even deeper awareness of the local economic sustainability issues. The analysis of the students' reflections, following open coding, highlighted key points related to economic sustainability, which are summarized as follows:

> I noticed that many open spaces in Haomei Village tend to become breeding grounds for litter and disorder, and there is a lack of businesses between points of interest that would encourage tourists to stop and stay longer. (S-3-315)

> The most distinctive feature I discovered in Haomei Village is the development of the primary industry. Through the local people's introduction, I learned that the fish ponds are divided into three layers: the top layer for heat-sensitive milkfish, the middle layer for shrimp, and the bottom layer for heat-sensitive clams. I believe that aquaculture in these fish ponds is the most unique aspect of Haomei Village. (S-3-418)

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> I think the community should improve certain aspects of its living amenities, such as building a PX Mart or convenience store, which would bring more convenience to both tourists and residents. Otherwise, you have to go far just to buy a drink. If the living amenities are improved, along with some events organized by the local residents, it might attract more people to visit. (S-4-612)

Table 7
Students' Impressions and Perceptions of Economic Sustainability in Haomei Village

Questionnaire Item	*M*	*SD*
The level of commercialization in Haomei Village is low.	4.24	0.60
There are few tourists in Haomei Village, resulting in a low level of crowding.	4.54	0.50

Additionally, students suggested that to stimulate local tourism and economic development, it would be beneficial to incorporate guided tours and in-depth travel experiences, or to integrate technology, making the experience more meaningful and engaging. The summarized research findings are as follows:

> Currently, I think what Haomei Village needs to improve is its marketing and promotion. Before visiting, I had almost never heard of this community. I believe there is a need for local guides to introduce the area, including the beach and beautiful scenery. Without a local person to point the way, visitors might not even notice these attractions, which I think is a missed opportunity for tourism. (S-5-510)

> During the visit to the 1920 Haomei Bao'an Forest, I encountered other casual visitors who complained that the windbreak forest was boring, which highlighted the importance of having a guide. (S-3-217)

> Haomei Village needs a systematic attraction (such as orienteering activities or city exploration challenges) to draw in outside tourists. If the number of tourists increases, it could boost local businesses (like the growth of snack shops), which in turn might attract young people to return to their hometown and start businesses. (S-3-215)

The research results indicate that students had a strong impression of the community's economic activities, particularly their concern for the tourism industry in rural areas. Since the tourism industry can be integrated with cultural and creative industries, students naturally focused on the intersection of this issue with their creative concepts. In this regard, some groups' creative concepts in their learning outcomes reflect their thoughts on economic sustainability. The design concept explanations for these cultural and creative products are presented in Table 8.

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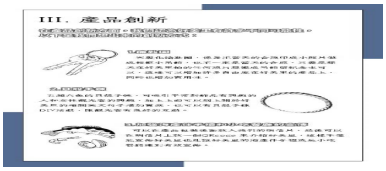
Table 8

Explanation of Students' Group Cultural and Creative Products and Economic Sustainability Concepts

Physical Presentation of Cultural and Creative Products and Design Process	Explanation of Creative Concept
   Design Process  	1. **Production Theme**: **Infinite Possibilities of Haomei** 2. **Design Concept**: The postcard design integrates the local oyster farming industry and includes an interactive experience. By scanning the QR code on the postcard, users can view 3D interactive animations, related videos, or narrated stories about the location on their smartphones. 3. **Sustainable Development Goal 8**: **Decent Work and Economic Growth**: The innovative use of technology in tourism and the sustainable development of local industries contribute to promoting a beneficial and sustainable tourism industry.
 Design Process 	1. **Production Theme**: **Haomei Boat House Gift Box** 2. **Design Concept**: Inspired by the appearance of the Haomei Boat House, the design is based on the "Fujian Ship" used by Yan Siqi, who led settlers to Taiwan in 1621. The gift box is designed as a cardboard box, with a focus on environmental friendliness and practicality. 3. **Sustainable Development Goal 12**: **Responsible Consumption and Production**: The design promotes sustainable tourism by emphasizing local culture and products through eco-friendly packaging.

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3. *The Implementation of the "Social Sustainability" Dimension in the Cultural Creativity and Industry Course*

Students' experiences during their visits to the community, particularly in relation to social sustainability, were analyzed through questionnaire results (as shown in Table 9). The findings indicate that students generally felt comfortable in the community and perceived it as warm and welcoming. During the community visits, students also reported interactions with local residents, which were reflected in their reflections. After open coding, the key points related to social sustainability were identified and summarized as follows:

> The part I liked most about Haomei Village was the warmth of the local people. During our group activity, we took a wrong turn and found ourselves getting farther from our destination, with the surroundings becoming increasingly desolate. We asked an elderly man for directions, and after answering, he could have just walked away. Instead, he turned back to tell us where the others were. This kind of scene can only be seen in a simple and honest seaside fishing village like this one! (S-3-621)

> The residents of Haomei Village were also very friendly and warm. The village chief even treated us to drinks. We also got to try oyster fritters and stir-fried clams. Originally, it was supposed to be clam soup, but the auntie was concerned that the hot soup would make us feel even hotter in the warm weather, so she prepared stir-fried clams instead. This thoughtful gesture made me feel the strong sense of community and warmth. (S-4-826)

Additionally, Table 9 shows that students generally felt that the public facilities and tourism information provided by government agencies were insufficient. This sentiment was also reflected in the analysis of students' reflections. The research findings are summarized as follows:

> I think the transportation needs improvement. Although Haomei Village doesn't have many residents, I noticed that some of the roads are not wide enough to accommodate tour buses side by side. Additionally, there doesn't seem to be a parking lot for visitors. This is quite unfortunate because it forces tourists to park temporarily in front of local residents' homes, which not only disrupts the residents' daily lives but also poses a safety risk for pedestrians. (S-1-223)

> I really like the atmosphere in Haomei Village. The residents are very friendly, and it made me feel comfortable and at ease. However, there are some areas that need improvement. The walking paths on the beach are uneven, which might be difficult for some visitors. I suggest adding ladders or ropes. Additionally, more bus stops or informational signage could be installed to improve transportation. (S-2-228)

Table 9
Students' Impressions and Perceptions of Social Sustainability in Haomei Village

Questionnaire Item	*M*	*SD*
The community atmosphere in Haomei Village is warm, friendly, and feels comfortable and relaxing.	4.17	0.58
Tourism information and public service facilities in Haomei Village are adequate.	3.40	0.65

The research results indicate that students also had keen observations regarding the social relationships within the community. Many of the students, having lived in urban areas for most of their lives, felt a deeper connection to the warmth and hospitality of rural areas. In this regard, some groups' creative concepts in their learning outcomes included interviews with local elders, exploring social sustainability issues. The design concept explanations for the

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cultural and creative products developed by the students under these considerations are detailed in Table 10.

Table 10

Explanation of Students' Group Cultural and Creative Products and Social Sustainability Concepts

Physical Presentation of Cultural and Creative Products and Design Process	Explanation of Creative Concept
 Design Process **Design Cards After Interviewing Community Elders, Then Use the Cards to Interact with the Community Elders.**	1. **Production Theme**: **Haomei Village Good Neighbor Cards** 2. **Design Concept**: The card deck consists of 54 cards divided into six major themes. The cards were created by students after interviewing and interacting with elderly residents in Haomei Village. These cultural and creative products aim to foster interaction with the elders and provide positive energy to the community. 3. **Sustainable Development Goal 3**: **Good Health and Well-being**: Elderly resources in rural communities are often limited. Social sustainability requires greater care and interaction to ensure the well-being of these communities.

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Physical Presentation of Cultural and Creative Products and Design Process	Explanation of Creative Concept
 Design Process 二、小組文創小物說明 我們選了在好美里住最深步時，隨處可見的明信片題來做照片拾想，文創小物是冰箱貼，冰箱貼的好處不僅僅現在於物功能上，這些貼片能夠將美麗的景色和獨特的文化充分呈現給人們，更重要的是，它能夠喚起人們的記憶和情感，每當人們接觸到家中有磁的家電保居產品，看到貼在上面的照片或圖案，都會想起和那個地方相關的回憶，無論是一次愉快的旅行，一段珍貴的時光，或是與親友共度的美好時刻，是一個能夠帶來情感共鳴和期望的媒介，冰箱貼還具有便攜攜帶和保存的特點，它們小巧輕便，不佔空間，非常方便攜帶，無論是在旅行途中，還是在不同的生活場景中，都可以輕鬆地將它們帶在身邊，它們的保存時間長，即使長時間放置，也不易受損壞或是花時間打理，長期保存回憶和情感，透過冰箱貼能夠傳遞好美里的特色和魅力傳遞給更多的人。	1. **Production Theme**: **Haomei Memories Fridge Magnets** 2. **Design Concept**: The inspiration comes from the idea of preserving the beautiful scenery, unique culture, and the warmth of Haomei Village's residents as cherished memories through these magnets. 3. **Sustainable Development Goal 12**: **Responsible Consumption and Production**: The magnets are designed to promote sustainable tourism by highlighting local culture and products. They are easy to collect and durable, thus embodying sustainability in both form and function.

Discussion

This study aimed to investigate how integrating cultural creativity into sustainability education could enhance university students' awareness and engagement with local community issues. The findings reveal that students gained significant insights into environmental, economic, and social dimensions of sustainability through experiential learning activities, particularly in the context of Haomei Village. These results contribute to the understanding of how localized, hands-on learning approaches can foster sustainability awareness in educational settings.

However, it is important to note that this study involved 75 students initially, but only 50 valid responses were collected, yielding a response rate of 67%. This smaller-than-expected sample size may influence the generalizability of the findings. Despite this limitation, the data collected still provide valuable insights into students' perceptions of sustainability and cultural creativity, which should be considered when interpreting the results.

The results align with prior studies emphasizing the role of experiential learning in promoting sustainability awareness. For example, Chang and Hsu (2010) highlighted that practical engagement fosters deeper understanding and critical thinking about sustainability issues. Similarly, this study demonstrated that students' field visits and cultural product designs significantly shaped their perceptions of local environmental and cultural themes. Students' positive responses to environmental imagery, such as the Haomeiliao Nature Reserve, are consistent with Elizabeth et al. (2012), who emphasized the importance of direct engagement with natural environments in shaping environmental stewardship.

At the same time, this study offers novel insights by demonstrating the integration of cultural creativity into sustainability education. Unlike Carnoy and Castells (2001), who emphasized top-down approaches, this study highlights the value of student-driven initiatives. For instance, the "Wanckan Mazu Blessing Canvas Bag" and "Haomei Village Landscape

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Calendar" designed by students illustrate how creative projects can effectively connect local cultural symbols with sustainable practices, thereby addressing both environmental and economic sustainability. These findings expand the existing literature by showcasing how creativity and sustainability can be interwoven to enhance community engagement.

However, this study also revealed challenges that align with broader discussions in the literature. Students noted the limited tourism infrastructure and inadequate public facilities in Haomei Village, which reflect broader issues of balancing development across sustainability dimensions. These observations are consistent with Carnoy and Castells (2001), who argued that achieving sustainable development in rural areas requires addressing economic and social disparities. This highlights the importance of collaborative efforts among universities, local communities, and policymakers to ensure holistic and inclusive sustainability practices.

Overall, the findings provide valuable insights into sustainability education by offering a replicable framework for integrating cultural creativity into university curricula. By connecting theoretical knowledge with practical, community-based activities, this study addresses a gap in sustainability education literature, emphasizing localized and practice-oriented approaches. Future research should focus on assessing the long-term impact of such interventions, exploring their scalability across diverse contexts, and examining community members' perspectives on university-led sustainability initiatives. These efforts will further refine the integration of cultural creativity and sustainability education, ensuring meaningful contributions to academic discourse and community development.

Conclusions and Implications

This study provides a novel framework that integrates cultural creativity into sustainability education, filling a gap in the current literature on experiential learning and sustainability practices. By participating in experiential learning activities, such as field visits and creative product designs, students gained a deeper understanding of community challenges and developed practical solutions to address environmental, social, and economic sustainability dimensions.

The findings have practical implications for designing university courses that address sustainability through localized and culturally relevant approaches. For instance, incorporating hands-on projects that engage students with local communities can foster both individual learning outcomes and collective social impacts. This framework serves as a model for integrating sustainability education into general curricula at higher education institutions, emphasizing the importance of community engagement and cultural awareness.

From an academic perspective, this research highlights the importance of experiential learning, demonstrating its effectiveness in fostering sustainability awareness and community engagement. It highlights the potential of such approaches to bridge the gap between theoretical knowledge and practical application, particularly in the context of community-based sustainability initiatives.

Future research could employ longitudinal case studies to assess the long-term impact of cultural product designs on community sustainability, providing concrete metrics for success. Additionally, studies should explore the scalability of this framework across diverse cultural settings to determine its adaptability and effectiveness in varying contexts. Finally, integrating technological tools, such as virtual reality or digital storytelling, could enhance the learning experience and broaden the reach of sustainability education programs.

Declaration of Interest

The authors declare no competing interest.

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THE IMPACT OF MATERNAL EMOTIONAL INTELLIGENCE AND BACKGROUND ON CHILDREN'S EMOTIONAL COMPETENCE

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Abstract

This study aimed to explore the relationship between maternal emotional intelligence, background factors, and children's emotional competence, focusing on how these factors contribute to the emotional development of children aged 1 to 6 years. Data were collected through a questionnaire survey using purposive sampling. A total of two hundred thirty-five mothers and their children participated, ensuring a balanced gender distribution. Results showed that children's emotional competence does not significantly differ by gender. The higher the emotional competence is, the greater the age and grade level are. Maternal emotional intelligence plays a significant role in predicting children's emotional competence. This study highlights the critical role of mothers' emotional support in fostering children's emotional growth. It also suggests that the role of fathers and other contextual factors must be considered to build a more comprehensive image.

Keywords: *emotional intelligence, emotional competence, maternal EQ*

Introduction

Emotional intelligence (EI) is the capacity to identify and comprehend one's own emotions as well as those of others, enabling individuals to express and justify emotions appropriately in social interactions (Salovey & Mayer, 1993). Goleman (1995) emphasizes that emotional intelligence, self-awareness, self-regulation, social skills, and empathy are essential in managing emotions or enhancing social interactions. He also stressed that the intelligence quotient (IQ) is less important than emotional intelligence (EQ) regarding the success pathway. Similarly, Mayer et al. (2004) highlight social adaptability more, stating the importance of emotional regulation. More publications in recent years pointed out that people who have the capability of higher emotional intelligence have higher self-esteem, have more advanced social skills, and can regulate their own emotions (Pandey & Choubey, 2010). In general, people with high emotional intelligence will consume less alcohol and report greater life satisfaction and better people contact (Austin et al., 2005; Palmer et al., 2002; Saklofske et al., 2003).

The family environment is equally critical in shaping an individual's emotional development. Shapiro (1997) notes that emotional support provided by family members is crucial for children's emotional growth. For instance, young children often imitate their parents' emotional responses, with parental expressions of emotion serving as behavioral models and references for children (Smith & Walden, 2001; Eisenberg et al., 1998). As a result, parents' emotional expressions have a considerable influence on their children's emotional development and impact their children's social development (Eisenberg et al., 1998).

In early childhood, mothers are often seen as primary emotional support providers, significantly influencing the development of their child's emotional competence. Eisenberg et al. (1996) have found that only maternal, rather than paternal, negative emotional responses predict a child's ability to regulate emotions. Similarly, Denham and Kochanoff (2002) have observed that positive emotional reactions from their mothers more strongly influence

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preschoolers' emotional knowledge. When emotional instability in mothers may reduce their adolescent's ability to cope with negative emotions, then increase the risk of psychological issues in the adolescent (Crespo et al., 2017). A mother's emotional intelligence significantly influences her child's ability to express emotions, establish social relationships, and adapt to different situations (Goleman, 1995). Tsai (2022) also proved that parental emotional ability is strongly related to the emotional ability of upper-elementary-aged children. Additionally, Zeng (2013) has noted a positive correlation between family financial status and positive parenting, suggesting that socioeconomic background substantially influences parenting approaches. Thus, parents' emotional intelligence, especially that of mothers, plays a crucial role in predicting their children's emotional competence.

Given the substantial influence of maternal emotional intelligence on children's emotional regulation and overall development, this study examines how maternal emotional intelligence influences children's emotional competence in Taiwan while accounting for background factors related to both mothers and children.

Research Problem, Focus, and Aim

The study addresses the current status of children's emotional competence, analyzing differences related to demographic variables and evaluating the influence of maternal emotional intelligence and background factors on children's emotional competence. This research contributes to the goals of inclusive and equitable quality education (SDG 4), highlighting the role of emotional competence in a child's educational journey. Additionally, it emphasizes the need to empower mothers as primary emotional caregivers through education and emotional development (SDG 5), supporting efforts to reduce disparities in emotional education and promote future generations' well-being.

Research Aim

The study aims to understand the current status of children's emotional competence and how mothers' background factors and emotional intelligence affect children's emotional competence.

Research Objectives

The study's objectives are listed as follows.

1. To assess the current status of children's emotional competence.
2. To analyze children's emotional competence according to their background factors.
3. To evaluate the impact of maternal emotional intelligence on children's emotional competence.

Research Methodology

General Background

Grounded in emotional intelligence theory, this study aims to examine the impact of maternal emotional intelligence on young children's emotional competence by employing a quantitative, cross-sectional approach. It was conducted over three months in early 2023, involving Taiwanese mother-child pairs, with data collected through physical and online surveys.

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Sample

To perform factor analysis and regression analysis with a significance level of 0.05, a power of 0.8, and a medium effect size, more than 200 sample sizes must be provided to ensure the results can be stable and interpretable. The research population consisted of 235 mother-child pairs in Taiwan, providing a broad view of family demographics and educational backgrounds. The children aged 1 to 6 years included boys (118, 50.2%) and girls (117, 49.8%), with some enrolled in kindergarten and others not. The largest age groups were 5-6 years (40.0%) and 1-2 years (28.5%). Among the mothers, the average age was 36.49 years (SD = 5.09), with most holding a university or associate degree (64.7%) and being married (96.6%). Family types were primarily nuclear families (67.2%), or three-generation households (27.7%), and 24.7% reported a monthly income of over NTD 100,000.

Instrument and Procedures

A questionnaire survey was used to gather data on background variables for both children and mothers. The "Mother's Emotional Intelligence Scale," adapted from Lin Wen-Ting's (2008) Teacher Emotional Intelligence Scale, consists of 21 items using the Likert scale (1: Strongly Disagree to 5: Strongly Agree). The higher scores indicate greater emotional intelligence. The "Children's Emotional Competence Scale," adapted from Jian Shu-Zhen and Li Zong-Wen's (2006) Emotional Domain Report, includes 31 items rated from (1) Never Occurs to (5) Always Observed, with higher scores reflecting better emotional competence. The survey also collected data on children's gender, kindergarten grade, and mothers' age, education level, household income, marital status, and family type. The participating mothers completed the questionnaires. Ethical procedures included obtaining informed consent from all participants and assuring anonymity and confidentiality.

Assessment of Scale Reliability and Validity

1. Reliability and Validity of Children's Emotional Competence

The Kaiser-Meyer-Olkin (KMO) value of .96 and a significant Bartlett's test ($\chi 2$=6089.935, df = 465, p < .001) confirm the data's suitability of the children's emotional competence scale for factor analysis. The analysis identified three factors: Emotional Understanding and Regulation, Emotional Recognition and Awareness, and Emotional Expression and Communication. The scale demonstrated excellent reliability, with Cronbach's α ranging from .83 to .97 across the subscales and total scale. The total variance explained by the factors was 65.05%. Moderately strong to extreme factor loadings and internal solid consistency confirm the scale's validity in measuring children's emotional competence across different dimensions.

Table 1
Factor Analysis and Reliability of the Children's Emotional Competence Scale

Statements and subscales	Cronbach-α	*KMO*	*L*	*r/itt*	Dissemination %
Emotional Understanding and Regulation	.96	0.96	.402~.941	.938**	55.83
Emotional Recognition and Awareness	.94	0.96	.472~.889	.936**	5.60
Emotional Expression and Communication	.83		.397~.919	.906**	3.620
Total Scale	.97	0.96	.397~.919	1	65.05

Note: ***p < .01, **p < .05, *p < .01

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2. Reliability and Validity of the Maternal Emotional Intelligence Scale

The Kaiser-Meyer-Olkin (KMO) value of 0.950. Moreover, a significant Bartlett's test ($\chi^2 = 3397.155$, df = 210, $p < .001$) confirms the data's suitability of the maternal emotional intelligence scale for factor analysis. The Emotional Understanding and Regulation subscale shows excellent reliability (Cronbach's $\alpha = .935$), with factor loadings ranging from .406 to .908, and explains 54.012% of the variance. The Emotional Recognition and Awareness subscale has strong internal consistency (Cronbach's $\alpha = .911$), with loadings from .308 to .962, explaining 5.845% of the variance. The total scale (items 1–21) demonstrates excellent reliability (Cronbach's $\alpha = .956$). Overall, the scales effectively measure their constructs, with the first factor explaining much of the variance.

Table 2
Factor Analysis and Reliability of the Maternal Emotional Intelligence Scale

Statements and subscales	Cronbach-α	*KMO*	*L*	*r/itt*	Dissemination %
Emotional Understanding and Regulation	.935	0.950	.406-.908	.949**	54.012
Emotional Recognition and Awareness	.911	0.950	.308-.962	.963**	5.845
Total Scale	.956	0.950	.308-.962	1	59.857

Note: ***$p < .001$, **$p < .01$, *$p < .05$

Data Analysis

Descriptive statistics summarized background information, including means, standard deviations, and frequency distributions. Student's *t-tests* and one-way ANOVA were conducted to examine gender and grade differences in children's emotional competence, respectively. Multiple linear regression analysis was used to evaluate the impacts of mothers' emotional intelligence and background factors, including maternal age, education level, marital status, and household income, on children's emotional competence.

Research Results

Current Status of Children's Emotional Competence

The analysis of children's emotional competence yielded mean scores across three key factors: Emotional Understanding and Regulation, Emotional Recognition and Awareness, and Emotional Expression and Communication. The mean score for Emotional Understanding and Regulation was 3.29 (*SD* = 0.897), indicating a moderate ability among children to recognize and regulate their emotions. The *skewness* was -0.907, suggesting that many children performed above average, while the kurtosis was 0.279, reflecting a relatively uniform distribution of scores. Emotional Recognition and Awareness had a mean score of 3.40 (*SD* = 0.796), reflecting that the studied children can recognize their own and others' emotions. The *skewness* was -0.437 and the *kurtosis* 1.964, suggesting that mothers think their children have better emotional recognition and awareness. Lastly, Emotional Expression and Communication received the highest mean score of 3.56 (*SD* = 0.785), with a *skewness* of -1.356 and a *kurtosis* of 1.904, indicating that mothers generally viewed their children as adept at expressing and communicating emotions effectively. This trend across all factors indicates that children's emotional competence is well-developed, particularly in expression and communication.

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Table 3
Descriptive Results of Current Status and Bivariate Correlations for Factors of Children's Emotional Competence (N =235)

Factor	*M*	*SD*	Skewness	Kurtosis	1	2	3	4
Emotional Understanding and Regulation	3.29	.897	-.907	.279	1			
Emotional Recognition and Awareness	3.40	.796	-.437	1.964	.831**	1		
Emotional Expression and Communication	3.56	.785	-1.356	1.904	.758**	.774**	1	
Total scale	3.42	.766	-1.358	1.755	.938**	.936**	.906**	1

Note: $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

Differences in Children's Emotional Competence According to Background Factors

As shown in Table 4, the analysis found no significant gender differences in emotional competence across all dimensions. The *p*-values for "Emotional Understanding and Regulation," "Emotional Recognition and Awareness," "Emotional Expression and Communication," and "Emotional Intelligence" were all above .05, indicating that boys and girls scored similarly in these dimensions.

Table 4
Differences in Children's Emotional Competence by Gender (N =235)

Dimension	Gender	*M*± *SD*	*t* value
Emotional Understanding and Regulation	Boy	3.321 ± 0.913	0.460
	Girl	3.267 ± 0.882	
Emotional Recognition and Awareness	Boy	3.415 ± 0.823	0.227
	Girl	3.392 ± 0.772	
Emotional Expression and Communication	Boy	3.589 ± 0.819	0.472
	Girl	3.541 ± 0.751	
Emotional competences	Boy	3.442 ± 0.793	0.419
	Girl	3.399 ± 0.740	

Note: $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

Table 5 presents the ANOVA results for the four dimensions of children's emotional competence. Significant differences were found between groups in all dimensions ($p < .001$). Post-hoc Scheffe tests indicate that Group 5 (Senior Class) differs significantly from the lower groups, with the order of significance descending as follows: Senior Class > Middle Class > Junior Class > Nursery Class > Not Enrolled.

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Table 5
Comparisons of Children's Emotional Competence Across Grade Levels (N =235)

Dimension	Grade	N	*M*	*SD*	*F*	Scheffe test
Emotional Understanding and Regulation	1. Not enrolled	44	2.58	1.26	11.22***	5>4>3>2>1
	2. Nursery Class	52	3.26	0.87		
	3. The junior class	38	3.43	0.75		
	4. The middle class	35	3.51	0.62		
	5. The senior class	66	3.60	0.50		
	Total	235	3.29	0.90		
Emotional Recognition and Awareness	1. Not enrolled	44	2.74	1.17	12.27***	5>4>3>2>1
	2. Nursery Class	52	3.40	0.74		
	3. The junior class	38	3.57	0.51		
	4. The middle class	35	3.59	0.58		
	5. The senior class	66	3.66	0.47		
	Total	235	3.40	0.80		
Emotional Expression and Communication	1. Not enrolled	44	2.90	1.09	11.73***	5>4>3>2>1
	2. Nursery Class	52	3.77	0.51		
	3. The junior class	38	3.60	0.79		
	4. The middle class	35	3.74	0.57		
	5. The senior class	66	3.73	0.56		
	Total	235	3.56	0.78		
Total Emotional competences	1. Not enrolled	44	2.74	1.12	13.52***	5>4>3>2>1
	2. Nursery Class	52	3.48	0.62		
	3. The junior class	38	3.53	0.61		
	4. The middle class	35	3.61	0.54		
	5. The senior class	66	3.66	0.47		
	Total	235	3.42	0.77		

Note: $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

Predictors of Children's Emotional Competence

The regression model in Table 6 demonstrated significant explanatory power, with an F-value of 6.738 ($p < .001$) and $R^2 = .193$, indicating that the model explains 19.3% of the variance in children's emotional competence. The analysis controlled several variables, including maternal age, education level, household monthly income, marital status, family type, child's gender, and age. The findings revealed that Maternal EQ significantly influences children's emotional competence with a coefficient of B = 0.241, β = 0.185, $p = .003$, indicating a positive relationship. Children's age also significantly impacts children's emotional competence with a coefficient of B = 0.173, β = 0.349, $p < .001$, indicating that as children grow older, their emotional abilities tend to improve.

In Contrast, the following variables did not show a significant impact on children's emotional competence: maternal age (B = 0.007, β = 0.047, $p = .466$), education level (B = 0.001, β = 0.001, $p = .911$), household monthly income (B = -0.036, β = -0.065, $p = .309$), and children's gender (B = -0.070, β = -0.046, $p = .448$).

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Overall, the model revealed that these independent variables explain approximately 19.3% of the variance in children's emotional competence, with significant effects attributed to Maternal emotional intelligence and children's age.

Table 6

The Effect of Maternal Emotional Intelligence on Children's Emotional Competence (N =235)

Variables	*b*	*SE*	β	*t*	R^2	*F*
constant	1.918	.658		2.914**	.193	6.738***
Maternal _EQ	.241	.080	.185	3.018**		
Maternal age	.007	.010	.047	.731		
Maternal education level	.001	.076	.001	.011		
household monthly income	-.036	.036	-.065	-1.019		
marital status	-.146	.179	-.051	-.817		
family type	.003	.033	.005	.083		
Children's gender	-.070	.092	-.046	-.760		
Children's age	.173	.033	.349	5.280***		

Note: $^{***}p < .001$, $^{**}p < .01$, $^{*}p < .05$

Discussion

This study aimed to assess the current status of children's emotional competence and examine how maternal background factors and emotional intelligence impact it. Previous research has established that children's emotional competence develops gradually, with expressive abilities emerging early and emotional regulation developing more slowly, often into adolescence (Thompson, 1991). These findings underscore the role of nurturing and the family environment in shaping emotional competence, where initial development in emotional expression precedes the more complex process of emotional regulation. This study supports these established patterns, finding that expressive and communicative abilities were more developed among kindergarten-aged children than emotional understanding and regulation. This suggests that early childhood programs should prioritize fostering expressive skills as foundational to broader emotional development, which can be further supported as children mature.

Another established finding in the literature is the varying role of gender in emotional competence, with some studies reporting significant gender differences while others do not (Eisenberg & Morris, 2002; Sharma, 2017). Our study found no significant differences in emotional competence by gender, suggesting that factors like maturation and educational experiences might have a more uniform impact across genders within this age range. However, this contrasts with the findings by Yan, Jing-Jing, and Ting-Ting (2016), who identified gender as a significant predictor. This discrepancy may be due to contextual factors, such as cultural or sample-specific characteristics, that warrant further research.

Regarding new contributions, this study identifies maternal emotional intelligence (EQ) and children's age as significant predictors of children's emotional competence, accounting for 19.3% of the variance. This finding aligns with prior research support emphasizing maternal emotional support's role in early development. However, our study provides a unique contribution by examining these relationships within a Taiwanese context, where family dynamics and cultural expectations may shape how maternal EQ influences children's emotional skills. This suggests that programs aimed at enhancing maternal EQ could have a meaningful impact on children's emotional development in early childhood education settings.

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While our model explains only a portion of the variance, this highlights the potential influence of unmeasured factors, such as environmental or social variables, on emotional competence. This underscores the complexity of emotional development and suggests that future research should consider longitudinal and qualitative approaches to capture these broader influences over time. Additionally, exploring the interaction between maternal EQ, children's age, and other contextual factors can yield, more profound insights into the intricate dynamics supporting early childhood emotional development.

Conclusions and Implications

While gender is not the main factor, children's emotional competence improves with age. The results also highlight the importance of maternal emotional intelligence in supporting children's emotional development. Educators and policymakers should consider strategies that enhance parental emotional competence as part of early childhood programs. Additionally, future research should further explore the varying effects of gender on emotional competence and examine how these factors interact over time. This can provide more tailored approaches for supporting emotional development in diverse contexts.

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FACILITIES AND EQUIPMENT IN CHILDCARE SETTINGS: PROMOTING A SUSTAINABLE ENVIRONMENT FOR INFANTS AND TODDLERS

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Abstract

Well-designed physical spaces and appropriate equipment are crucial for enhancing the quality of care and education for infants and toddlers. Four key areas were examined hygiene and safety, learning and development, space and facility management, and sustainability. The study sampled childcare centers based on their geographic distribution and type, including 193 centers—155 public and 38 private. The findings reveal disparities in facilities and equipment between public and private centers, highlighting the need for more detailed regulations and sustainable practices. Public centers, which benefit from government funding, typically offer higher-quality facilities, whereas private centers, constrained by costs, often lack sustainable equipment and caregiver-friendly amenities. Additionally, the potential risks associated with over-reliance on soothing chairs, baby cradles, and playpens may impede toddlers' physical development. The results underscore the need for clear guidelines to help private centers enhance their facilities and call for more specific standards, especially in rapidly expanding public childcare services in Asian countries, to ensure that childcare environments support the well-being of both children and caregivers.
Keywords: *childcare settings, caring environment, infants and toddlers, sustainable environment*, age-*appropriate*

Introduction

Examining the facilities in childcare centers is essential to understanding how these environments support safe, nurturing, and stimulating experiences crucial for children's development. High-quality childcare settings significantly impact developmental outcomes, particularly in fostering cognitive, emotional, and social growth (Berti, 2019; Marshall, 2011). For instance, enriched environments with diverse resources encourage learning, creativity, and social skills, creating foundational benefits that extend throughout childhood and into adulthood (Chen & Wang, 2018; von Suchodoletz et al., 2023). This study addresses the need for comprehensive assessments of childcare environments, focusing on the availability of clean, safe, and developmentally appropriate resources that promote optimal growth and learning.

Studies have underscored the critical role of high-quality childcare in reducing educational disparities, particularly for children from low-income families (Donoghue, 2017; Vandell & Wolfe, 2000). By setting high standards for childcare facilities, countries enhance children's early learning experiences and long-term outcomes, thus contributing to broader educational

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and social benefits. However, existing research on childcare settings highlights a significant gap in knowledge regarding the age-appropriate design and equipment of these facilities, especially in relation to sustainable practices that benefit both children and the environment. This study addresses this gap by examining how the layout, materials, and environmental features of childcare centers affect children's health and well-being.

Furthermore, sustainable facility design gains increasing attention due to its potential to provide healthier, more eco-friendly spaces. Incorporating natural light, green spaces, and eco-friendly materials in childcare environments improves aesthetics and supports children's physical and mental well-being (Tonge et al., 2019; Ulset et al., 2017). Noise reduction, safe play areas, and natural lighting are vital components of a well-designed childcare center that prioritizes children's comfort and developmental needs. Notably, sleep-related safety guidelines and interventions for reducing illness through improved hygiene and disinfection standards illustrate the importance of facility design in safeguarding children's health (Moon et al., 2022; Staniford & Schmoidtke, 2020).

Despite these recognized needs, limited research exists on age-specific, sustainable facility practices for infants and toddlers in childcare settings. Addressing this gap, our study emphasizes the need for detailed planning and sustainable design in childcare environments to support both developmental outcomes and environmental sustainability. By examining childcare facilities with a focus on age-appropriate equipment and sustainable practices, this study contributes to a growing body of knowledge aimed at fostering safe, supportive, and eco-friendly environments for young children, which is of increasing relevance in both national and international contexts.

Research Focus and Research Questions

The extant literature on regulations and related research concerning the physical environment in childcare centers were reviewed. The evidence-based design approaches were applied to explore the relationships between the types of childcare settings (public/private), the different ages of young children, and the equipment and facilities in nursery rooms, with practical applications for educators. The discussions of childcare quality can be addressed in the physical environment of childcare centers.

The research questions were proposed as following:

1. Hygiene and Safety: How do the hygiene facilities in public and private childcare centers in Taiwan compare, and what impact do they have on the well-being of children and childcare providers?

2. Learning and Development: What are the specific facility needs for infants under 18 months compared to older toddlers, and how well are these needs being met in public versus private childcare centers?

3. Space and Facility Management: How does the allocation of space in childcare centers contribute to creating an optimal environment for young children?

4. Sustainable Environment: How do childcare centers create a sustainable and supportive environment for both children and childcare providers?

The crucial role of well-designed physical spaces and appropriate equipment in enhancing the quality of care and education for infants and toddlers were addressed. It also provides practical suggestions for improving childcare environments.

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Research Methodology

Background

This research represents the first large-scale field investigation of facilities and equipment in childcare centers across Taiwan. Employing a quantitative approach, it examines the current facilities and equipment provided by these centers. The findings aim to depict the present conditions of the sampled childcare centers, and generate recommendations to support quality improvements in childcare centers.

Sample

The study population consisted of 1,506 childcare centers across Taiwan, as reported by the Social and Family Affairs Administration (2023). These centers are categorized into public childcare homes, public childcare centers, and private childcare centers. Public childcare homes, which care for up to 12 infants and toddlers aged 2 and under, along with public childcare centers, are government-funded and operated by non-profit organizations (NPOs). Of the 1,506 centers, 1,121 (74.4%) are private, 235 (15.6%) are public childcare centers, and 150 (10.0%) are public childcare homes. Notably, 78.6% (n=1,184) of these centers are located in high-density, urban areas.

To obtain a representative sample, centers were selected based on both geographic distribution (north, central, and south regions) and type (public or private). The sampling was conducted in two layers. The first layer involved selecting centers by type, resulting in 220 public and 80 private centers. This higher proportion of public centers reflects their adherence to stricter regulatory standards. However, private centers had a rejection rate of 19.8%, impacting participation levels.

The second layer accounted for geographic location, ensuring proportional representation of public and private centers from each city or county. Centers were randomly selected through computer algorithms, producing an initial total of 300 centers. If a center declined participation, a substitute from a reserve list was approached.

Ultimately 193 childcare centers participated in the study, comprising 155 public and 38 private centers. Among these, 67 centers were located in northern Taiwan, 34 in the central region, 79 in the southern region, and 13 in the eastern region and outlying islands. In terms of physical location, 58.1% of the centers were situated on the ground floor, 29.0% on the second floor, and 12.9% on the third floor.

Instrument and Procedures

The field investigation worksheet is a comprehensive tool designed to systematically assess the quality and safety of physical spaces in childcare centers. It is divided into five sections, each targeting specific areas critical to providing a supportive and sustainable environment for young children. (1) Basic information: This section records fundamental details about each center, including location (city/county), type (public or private), floors occupied, and the number of children authorized and currently enrolled. (2) Hygiene and safety: Focusing on health-related features, this section verifies the presence of essential hygiene facilities, such as continuous drinking water, baby bathtubs with handrails, anti-slip features, blanket cabinets with anti-pinch measures, and separate refrigerators for breast milk. (3) Learning and development: This area assesses the physical environment's suitability for promoting early childhood learning, including the availability of natural light, activity area illumination (measured with a light meter), air purifiers, and items such as soothing chairs, baby cradles, and playpens. (4) Space

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and facility management: Addressing the management of non-childcare facilities, this section includes restrooms, kitchens, and storage spaces. Key measures include the presence of shower facilities, tap and washbasin placement, pest prevention in kitchens, and smoke extraction systems, as well as whether children bring their own tableware. (5) Sustainable environment: This final section evaluates sustainability features, such as fire escape spaces, caregiver-friendly nursing/feeding chairs, windows, and adult toilets in childcare spaces.

Field data collection was conducted by rigorously trained interviewers who visited each participating center to ensure data quality and consistency. Interviewers initially contacted the sampled childcare centers to arrange appointments with those that agreed to participate. During each visit, interviewers completed field investigation worksheets, documenting the centers' current conditions. They used tools such as a light meter and ruler for accurate measurements. On average, it took approximately one hour to complete all items and measurements. Each completed worksheet was coded anonymously, omitting the names of individual childcare centers. Results are presented in aggregate form, ensuring that no individual center is identifiable.

Data Analysis

Descriptive statistics and cross-tabulation analysis were used to present the situation in childcare centers and to compare the results between welfare-oriented (public) and business-oriented (private) centers. Descriptive statistical parameters, including mode, median, and mean, were employed to evaluate the current state of facilities and equipment in the sampled childcare centers. These evaluations focused on aspects such as hygiene and safety, learning and development, space and facility management, and sustainable environment. Additionally, cross-tabulation analysis was conducted to compare different types of childcare centers and the ages of the children.

Research Results

Hygiene and Safety

Six items of hygiene and safety were measured, including the continuous supply of drinking water, baby bathtubs with child handrails, baby bathtubs with hand soap and paper towels, non-slip designs in baby bathtubs, blanket cabinets with anti-pinch measures, and separate breast milk refrigerators. The descriptive analysis shows that 97.7% of childcare centers are equipped with baby bathtubs that have hand soap and paper towels, but only 39.4% have child handrails to prevent slipping, and 36.7% have non-slip designs in the baby bathtubs. Among these features, significant differences were observed between public and private childcare centers in baby bathtubs with child handrail ($p < .001$***) and non-slip design in baby bathtubs ($p = .02$*) (Table 1).

Table 1
Chi-Square Test Results for Hygiene and Safety Facilities in Public and Private Sectors

Feature	Public (%)	Private (%)	Total (%)	χ^2	*p*-value
Continuous supply of drinking water	74.8	72.5	74.3	0.176	.68
Baby bathtub with child handrail	44.1	21.8	39.4	12.851	<.001***
Baby bathtub with hand soap and paper towels	98.4	95.5	97.7	2.586	.11
Non-slip design in baby bathtubs	39.7	25.6	36.7	5.197	.02*
Blanket cabinet with anti-pinch measures	87.2	82.9	86.3	0.982	.32
Separate breast milk refrigerator	54.3	51.2	53.6	0.231	.63

*$p < .05$, **$p < .01$, ***$p < .001$

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Classrooms for toddlers under 18 months showed significant differences from those for older children in the features of non-slip designs in baby bathtubs (p = .01*) and separate breast milk refrigerators (p = .001**) (Table 2). Classrooms for toddlers under 18 months were more likely to be equipped with non-slip designs in baby bathtubs and dedicated refrigerators for breast milk storage.

Table 2
Chi-Square Test Results for Hygiene and Safety Facilities in the Classrooms of Different Ages

Feature	<18 months (%)	>18 months (%)	Total (%)	χ^2	*p*-value
Continuous supply of drinking water	70.1	78.1	74.3	2.958	.09
Baby bathtub with child handrail	35.6	42.7	39.4	1.894	.17
Baby bathtub with hand soap and paper towels	97.6	97.8	97.7	0.01	.92
Non-slip design in baby bathtubs	43.8	31.1	36.7	6.241	.01*
Blanket cabinet with anti-pinch measures	87.4	86.5	86.3	0.068	.79
Separate breast milk refrigerator	62.8	45.9	53.6	10.241	.001*

*p < .05

Learning and Development

Five items related to learning and development were measured: natural light, air purifiers, soothing chairs or baby cradles, and playpens. Soothing chairs and baby cradles are intended to provide comfort and calm for infants.

According to our survey, 25.9% of the childcare centers use soothing chairs or baby cradles for toddlers, and 11.1% utilize playpens, potentially limiting toddlers' activity space. Additionally, only 78.9% of nursery classrooms provide natural light. In terms of illumination, 49.2% of the nursery classrooms had lighting levels exceeding 700 lux, although the recommended standard is between 350-700 lux.

Significant differences were identified between public and private childcare centers in several aspects, including activity area illumination (p < .001***), the presence of natural light in classrooms (p =.03*), and the use of soothing chairs or baby cradles (p = .01*) (Table 3). These results indicate that private childcare centers are more inclined to utilize soothing chairs or baby cradles to calm toddlers and employ playpens to restrict toddlers' movement. Conversely, public childcare centers reported a significantly higher percentage (54.3%) of activity area illumination exceeding 700 lux, compared to 32.7% in private centers. This finding suggests that caregivers in these settings may require greater awareness of the potential negative effects of excessively bright illumination on toddlers.

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Table 3
Chi-Square Test Results for Learning and Development Facilities in Public and Private Sectors

Feature	Public (%)	Private (%)	Total (%)	χ^2	*p*-value
Natural light	89.5	81.4	87.6	4.71	.03*
Activity area illumination				15.15	<.001***
<350lux	3.7	8.2	4.8		
350-700 lux	41.9	59.2	46.1		
>700lux	54.3	32.7	49.2		
Air purifier	64.0	59.8	62.9	0.586	.44
Soothing chair or baby cradle	22.9	37.0	25.9	6.627	.01*
Playpen	9.9	15.4	11.1	1.858	.17

*$p < .05$, ***$p < .001$

Classrooms for toddlers under 18 months exhibited significant differences compared to those for older children in various aspects, including the availability of natural light ($p = .04$*), activity area illumination ($p = .01$*), the use of soothing chairs or baby cradles ($p < .001$***), and playpens ($p = .03$*) (Table 4). The findings suggest that childcare centers catering to toddlers under 18 months are more likely to be equipped with facilities designed for rest, such as baby cradles and playpens. However, it is important to consider the potential risks associated with over-reliance on these facilities, which may limit toddlers' opportunities for physical activity and exploration for extended periods. Furthermore, the results indicate a potential misconception among caregivers that toddlers under 18 months primarily require sleep, leading to insufficient attention to the importance of natural light in these classrooms.

Table 4
Chi-Square Test Results for Learning and Development Facilities in the Classrooms of Different Ages

Feature	<18 months (%)	>18 months (%)	Total (%)	χ^2	*p*-value
Natural light	83.8	90.6	87.6	4.264	.04*
Activity area illumination				8.592	.01*
<350lux	6.3	3.5	4.8		
350-700 lux	51.7	40.3	46.1		
>700lux	42.0	56.3	49.2		
Air purifier	65.6	63.5	62.9	0.184	.72
Soothing chair or baby cradle	37.0	17.2	25.9	18.568	<.001***
Playpen	14.6	7.5	11.1	4.799	.03*

*$p < .05$, ***$p < .001$

Space and Facility Management

Nine items related to space and facility management were assessed: restrooms with hot and cold shower facilities, restrooms with taps at standard distances, washbasins at standard

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heights, kitchens with screen doors or plastic curtains to prevent bugs and mosquitoes, stainless steel kitchen counters, kitchens equipped with smoke extraction systems, children bringing their own tableware, fire doors or smoke extraction systems, and storage spaces. According to the survey, 92% of kitchens are equipped with screen doors or plastic curtains to prevent bugs and mosquitoes, but only 45.5% use stainless steel counters, and 55.2% of restrooms have taps at the standard distance. Therefore, it is recommended that childcare centers select appropriate materials for kitchen counters to enhance better health outcomes for toddlers.

Kitchens equipped with screen door or plastic curtain is essential to prevent bugs or mosquitoes while preparing food for toddlers, especially in tropical/subtropical regions. Childcare centers encourage toddlers to wash their hands, and this is an essential hygiene procedure, particularly after a pandemic period. Childcare centers have to provide sufficient amounts of taps for toddlers with suitable height and distance. It is suggested that two taps shall be at a distance of at least 15.75 inches according to the toddlers' shoulder to shoulder when two toddlers stand together.

Significant differences were observed between public and private childcare centers in several space and facility management items, including restrooms with two taps at standard distance (p = .01*), kitchens with smoke extraction system (p = .01*), and children with their own tableware (p < .001***). However, significant differences were not found in space and facilities management items between classrooms for different age groups of toddlers (Table 5).

Table 5

Chi-Square Test Results for Space and Facilities Management in Public and Private Sectors

Feature	Public (%)	Private (%)	Total (%)	χ^2	*p*-value
Restroom with hot and cold shower facilities	63.0	53.9	58.1	0.57	.45
Restroom with two taps at standard distance (15.75 inches)	60.1	33.3	55.2	8.510	.01*
Washbasin at standard height (19.69 inches)	75.4	61.5	72.5	3.945	.05
Kitchen with screen door or plastic curtains to prevent bugs and mosquito	90.6	95.4	92.0	1.878	.17
Stainless steel kitchen counter	45.0	47.4	45.5	0.07	.79
Kitchen equipped with smoke extraction system	97.4	80.5	84.0	6.37	.01*
Children bring their own tableware	93.3	63.2	87.2	24.571	<.001***
Fire door or smoke extraction system	81.6	66.9	69.8	3.122	.08
Storage room	79.2	73.0	78.0	0.679	.41

*p < .05, ***p < .001

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Table 6
Chi-Square Test Results for Space and Facilities Management in the Classrooms of Different Ages

Feature	<18 months (%)	>18 months (%)	Total (%)	χ^2	*p*-value
Restroom with hot and cold shower facilities	52.1	58.3	58.1	0.604	.44
Restroom with two taps at standard distance (15.75 inches)	45.7	56.5	55.2	1.336	.25
Washbasin at standard height (19.69 inches)	75.0	72.5	72.5	0.131	.72
Kitchen with screen door or plastic curtains to prevent bugs and mosquito	NA	NA	92.0	NA	NA
Stainless steel kitchen counter	NA	NA	45.5	NA	NA
Kitchen equipped with smoke extraction system	NA	NA	84.0	NA	NA
Children bring their own tableware	NA	NA	87.2	NA	NA
Fire door or smoke extraction system	NA	NA	69.8	NA	NA
Storage room	NA	NA	78.0	NA	NA

Notes: 'NA' indicates that a 2*2 table cannot be achieved, so chi-square test cannot be performed.

Sustainable Environment

Four items related to sustainable environment were measured: fire escape space, nursing chair/feeding chairs friendly to childcare givers, windows in childcare spaces, and adult toilets in childcare spaces. According to our survey, all childcare centers were equipped with windows. However, only 18.8% were equipped with fire escape spaces, 33.7% with feeding chairs friendly to caregivers, and less than half (44.6%) had adult toilets in the classrooms. Fire escape space showed significant differences (p= .004**) between public and private sectors (Table 7).

Table 7
Chi-Square Test Results for Sustainable Environment in Public and Private Sectors

Feature	Public (%)	Private (%)	Total (%)	χ^2	*p*-value
Fire escape space	34.2	14.3	18.8	8.118	.004**
Nursing chair/ feeding chair (friendly to childcare givers)	35.6	28.0	33.7	1.973	.16
Windows in childcare space	100	100	100	NA	NA
Adult toilet in childcare space	46.9	45.7	46.6	0.042	.84

**$p < .01$

Nursing chair (friendly to childcare givers) ($p < .001$***) and adult toilet in childcare space ($p < .001$***) showed significant differences between classrooms of different age groups (Table 8).

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Table 8
Chi-Square Test Results for Sustainable Environment in the Classrooms of Different Ages

Feature	<18 months (%)	>18 months (%)	Total (%)	χ^2	*p*-value
Fire escape space	NA	NA	18.8	NA	NA
Nursing chair/ feeding chair (friendly to childcare givers)	48.6	23.0	33.7	29.318	<.001***
Windows in childcare space	NA	NA	100	NA	NA
Adult toilet in childcare space	35.2	56.4	46.6	17.281	<.001***

***$p < .001$

Discussion

This study examines critical aspects of childcare center environments in Taiwan, focusing on hygiene and safety, learning and development, space and facility management, and sustainable environment. Through analyzing 193 centers, this research highlights essential differences in facility standards and reveals significant needs in sustainable practices, underscoring the importance of childcare facility quality for both developmental outcomes and the well-being of caregivers.

Key findings include high compliance in basic hygiene, such as the presence of baby bathtubs with hand soap and kitchens equipped with protective screens to prevent bugs. This level of compliance largely results from stringent hygiene regulations enforced following the pandemic, which have positively impacted practices across childcare centers. Yet, the study reveals considerable gaps, especially in sustainable practices. For instance, many centers lack essential sustainable features, such as fire escape provisions and ergonomically designed nursing chairs for childcare providers. These findings emphasize the critical role of sustainable facilities in supporting both children's safety and caregivers' well-being, revealing a need for stronger regulations in sustainability (Di Schino, 2020). This aligns with research by Lekan-Kehinde & Asojo (2021), which emphasizes that environments that consider children's sensory needs—avoiding excessive brightness, for instance—support focus and engagement by reducing visual discomfort and fatigue.

Another important finding relates to disparities between public and private centers. Public centers, benefiting from government funding, are generally better equipped with facilities like non-slip bathtubs, child handrails, and ample natural lighting. In contrast, private centers, often limited by budget constraints, show lower compliance with certain standards, underscoring the need for clear guidelines and support to help these centers achieve sustainable quality in their facilities. The chi-square test results further illuminate these disparities, demonstrating the structural inequities between public and private centers. Enhancing quality standards for private childcare facilities is vital to ensure equitable access to high-quality, safe environments for all children, regardless of center type. The importance of high-quality environments for young children is further supported by studies showing that quality early care is linked to positive cognitive and social development outcomes, particularly in children from low-income families (Donoghue, 2017; Vandell & Wolfe, 2000).

Findings also indicate that soothing chairs, baby cradles, and playpens are more prevalent in classrooms for toddlers under 18 months, often used to manage children's behavior. However, an over-reliance on these items can restrict physical movement, limiting opportunities for exploration and gross motor development, which are crucial in early childhood (Yogman et al., 2018; Sharyn et al., 2023). Public centers, benefiting from better caregiver-to-child ratios, are

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less dependent on such equipment, fostering more active engagement and physical development in young children. This insight emphasizes the importance of age-appropriate practices and highlights a critical area where caregiver training on equipment use and child development could greatly benefit childcare settings. These findings align with the broader recommendations from NAEYC (2019), which encourage environments that promote active exploration while minimizing the use of restrictive items, supporting children's physical development.

In terms of caregiver-friendly amenities, the study identified considerable gaps, particularly in the provision of facilities like feeding chairs and adult toilets across different age groups. These amenities are essential for a supportive environment that sustains caregiver well-being, irrespective of children's ages. Improving these aspects can help establish a sustainable and supportive environment in which caregivers can comfortably attend to children's needs without compromising their own health or comfort. These findings are consistent with Di Schino (2020), who underscores the importance of ergonomic design and high-quality materials for ensuring caregiver and child well-being in childcare environments. Similarly, standards such as those put forth by NAEYC (2019) recommend detailed guidelines for maintaining a safe, clean, and well-equipped childcare setting.

Furthermore, the importance of high-quality childcare facility design is corroborated by longitudinal research. For example, the NICHD Early Child Care Research Network (2006) found that children in higher-quality environments—those with clean, safe, and well-resourced facilities—showed improved cognitive, language, and social development through elementary school. This finding is echoed in the Effective Provision of Pre-School Education (EPPE) Project in the UK, which demonstrated that well-resourced, safe, and organized physical environments positively affected children's academic and behavioral outcomes (Sylva et al., 2010). Moreover, the Quality Interventions for Early Care and Education (QUINCE) Study also found that facility quality improvements, such as better hygiene practices and material organization, significantly benefited children's language and social skills (Bryant et al., 2006). These studies align with our findings and support the importance of infrastructure and resource quality for long-term developmental benefits in children.

The findings underscore the need for more specific guidelines, beyond general standards, to ensure high-quality childcare environments. This is particularly crucial in Asian contexts where public childcare services are expanding rapidly in response to low fertility rates. Countries such as Korea, Japan, Singapore, and Taiwan stand to benefit from targeted standards that address the unique needs of infants, toddlers, and caregivers while emphasizing sustainability. High-quality childcare encompasses not only educational aspects and staff ratios but also infrastructure and equipment standards that holistically support children's developmental needs and caregivers' work conditions. These findings resonate with international recommendations for sustainable design in childcare, where eco-friendly materials and careful facility planning are shown to enhance both child and caregiver well-being (Lekan-Kehinde & Asojo, 2021).

Conclusions and Implications

This study highlights the complex interplay of hygiene and safety, learning and development, space and facility management, and sustainable environment appropriateness in childcare settings. The findings call for stricter, more detailed regulations, particularly concerning sustainable practices, to enhance childcare quality in Taiwan. Addressing these needs is essential to create environments conducive to healthy development and caregiver support.

For educational and research practice, these results point to several implications. Firstly, educational initiatives should prioritize caregiver training on age-appropriate equipment use, emphasizing the importance of active engagement over reliance on restrictive items like

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soothing chairs and playpens. Furthermore, research should continue exploring the impact of sustainable design features on children's development and caregiver well-being, as this area remains under-researched, particularly in childcare settings for very young children.

Additionally, future studies could focus on longitudinally examining the impact of facility quality on developmental outcomes, especially in private centers where resources may be limited. Longitudinal findings, such as those demonstrating that high-quality physical environments have lasting impacts on children's cognitive and social development, encourage further exploration of infrastructure quality as a crucial component of early childhood environments. Such research would support policymakers in designing interventions that ensure high standards across both public and private centers.

In summary, this research highlights significant disparities and improvement areas in Taiwanese childcare facilities, with an emphasis on sustainability, hygiene, and developmental appropriateness. These findings provide valuable insights for policymakers, educators, and researchers focused on enhancing childcare quality, underscoring the need for targeted interventions that address both the immediate safety and the long-term developmental benefits of young children in childcare settings.

Limitations and suggestions

The findings of this study indicate several practical implications for improving childcare center quality and sustainability. There is a critical need for more detailed regulations and standards, particularly in private childcare centers, to ensure consistent care quality. Investments in facility upgrades, particularly regarding hygiene and caregiver-friendly features, are essential. Creating a supportive environment for both caregivers and toddlers is crucial, including reducing reliance on soothing chairs and playpens and preventing exposure to intense light in activity areas. Furthermore, continuous caregiver training is necessary to balance rest and physical activity for toddlers, alongside regular monitoring of childcare centers to ensure adherence to these standards.

This study presents survey results from 193 childcare centers, yet it does not address the long-term effects of facilities and equipment on toddlers, which represents a significant limitation. Additionally, the study suggests that private childcare centers may prioritize cost considerations, leading to disparities in facilities compared to publicly funded centers. While the study highlights certain deficiencies in private centers, the question of whether these centers should be held to the same standards as public ones or whether selected features should be mandated by official regulations remains a consideration for policymakers.

Addressing these limitations and incorporating the suggested improvements would provide a more comprehensive understanding of the factors influencing the quality of childcare environments. Future research may aim to create a holistic picture that includes physical facilities, caregiver interactions, and broader socio-economic contexts to inform policies and practices that support the optimal development of young children.

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Declaration of Interest

The authors declare no competing interest.

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Appendix 1

Field Investigation Worksheet of Facilities and Equipment in Childcare Centers

I. Basic information
1. Location: _____city/county
2. Type of the childcare institution: A. Public Childcare Center B.Private Childcare Center C. Public Childcare Home
3. Floor(s) of the childcare institution (multiple ticks): A. 1st Floor B.2nd Floor C.3rd Floor
4. Number of children they are authorized to take: _____ and they actually take:_____

II. Hygiene and Safety
5. Continuous supply of drinking water (Y/N)
6. Baby bathtub with child handrail (Y/N)
7. Baby bathtub with hand soap and paper towels (Y/N)
8. Non-slip design in baby bathtubs (Y/N)
9. Blanket cabinet with anti-pinch measures (Y/N)
10. Separate breast milk refrigerator (Y/N)

III. Learning and Development
11. Nursery room with nature light (Y/N)
12. Activity area illumination: measure with light meter
13. Air purifier (Y/N)
14. Soothing chair or baby cradle (Y/N)
15. Playpen (Y/N)

IV. Space and Facility Management (Non Childcare Facilities)
16. Restroom with hot and cold shower facilities (Y/N)
17. Restroom with two taps at standard distance (regulation: 15.75 inches): measure with a ruler
18. Washbasin at standard height (regulation: 19.69 inches): measure with a ruler
19. Kitchen with screen door or plastic curtains to prevent bugs and mosquitoes (Y/N)
20. Stainless steel kitchen counter (Y/N)
21. Kitchen equipped with smoke extraction system (Y/N)
22. Children bring their own tableware (Y/N)
23. Fire door or smoke extraction system (Y/N)
24. Center equipped with storage room (Y/N)

V. Sustainable Environment
25. Fire escape space (Y/N)
26. Nursing chair/ feeding chair (friendly to childcare givers) (Y/N)
27. Windows in childcare space (Y/N)
28. Adult toilet in childcare space (Y/N)

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THE PRACTICE OF UNIVERSITY SOCIAL RESPONSIBILITY AND GENERAL EDUCATION: PROMOTING COMMUNITY COLLABORATION AND STUDENT ENGAGEMENT THROUGH MICRO-COURSES

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Abstract

In an era of growing emphasis on sustainable development and the social responsibility of higher education, universities are increasingly seeking innovative ways to integrate learning with community engagement. This study aims to integrate University Social Responsibility (USR) with general education through micro-courses focused on Community-Based Tourism (CBT) within a Participatory Action Research (PAR) framework. A research team from National Chiayi University collaborated closely with the Haomei community in Taiwan over a two-year period to co-develop courses covering religious traditions, industrial culture, historical heritage, and ecological conservation. These courses provided students with immersive, hands-on learning experiences. A total of 78 students from 28 academic disciplines participated, enhancing their sense of social responsibility and community engagement. The findings reveal five key factors essential for successful university-community collaboration: trust building, shared objectives, continuous communication, resource sharing, and adaptability. The study demonstrates that integrating USR with innovative educational practices can drive universities to become agents of social change. This model not only strengthens student learning and engagement but also promotes sustainable community development, offering a valuable framework for higher education institutions worldwide.
Keywords: *university social responsibility, community-based tourism, participatory action research, general education, university-community collaboration*

Introduction

As societal expectations for higher education institutions continue to rise, universities worldwide are increasingly viewed not only as central hubs for the dissemination of knowledge but also as pivotal agents of social change. University Social Responsibility (USR) has emerged as a concrete means of fulfilling this role and has become one of the global trends in higher education development (Amutuhaire, 2023; Jones et al., 2021; Pactwa et al., 2024). The promotion of USR emphasizes responding to societal needs and highlights universities' active role in addressing global challenges such as climate change and social inequality (Dias, 2024; Liu, 2023). Against this backdrop, universities in Taiwan are gradually integrating into this international trend and actively exploring local implementations of USR (Chen, 2022; Tseng & Lin, 2022).

Over the past two years (from July 2022 to July 2024), a team from National Chiayi University has engaged deeply with local communities, working closely with residents to promote an innovative model of education and social practice that combines Micro-Courses

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in General Education, Community-Based Tourism (CBT), and Participatory Action Research (PAR). These micro-courses include topics such as religious beliefs, industrial culture, cultural history, and natural ecology, all framed under the concept of sustainable tourism. They provide students with opportunities to engage with real community settings, enriching their learning experiences and deepening their understanding and involvement in social issues, thus embodying the core spirit of USR.

This study documents and analyzes the process of relationship-building, collaborative planning, execution, and reflection between National Chiayi University and the community, summarizing the key factors for successful collaboration. Through the integration of USR, micro-courses in general education, CBT, and PAR, National Chiayi University has strengthened its ties with the community and has promoted the holistic development of its students. It has also played a significant role in advancing sustainable development.

Literature Review

The practical experiences of National Chiayi University demonstrate how a university can effectively combine Micro-Courses in General Education, Community-Based Tourism (CBT), and Participatory Action Research (PAR) to promote University Social Responsibility (USR) and respond to societal needs. This provides a valuable reference for the present study. Therefore, this chapter reviews relevant literature to explore how universities, through general education and social practice, can foster collaborative development with communities.

University Social Responsibility

University Social Responsibility (USR) refers to a university's proactive efforts to address societal needs through education, research, and social service, with the aim of promoting social justice, enhancing social well-being, and advancing sustainable development (Özdemir, 2024; Valencia-Arias et al., 2024) As societal expectations for higher education institutions have increased, universities are now seen as not only centers for the dissemination of knowledge but also as driving forces for social change (Amutuhaire, 2023; Jones et al., 2021; Pactwa et al., 2024) In Taiwan, the promotion of USR has largely relied on government policies, such as the "Higher Education Sprout Project" initiated in 2008. Universities have actively responded to and participated in these initiatives, but they have often been led by university personnel, focusing on actions and achievements from the university's perspective. This unidirectional implementation model may lead to limitations, failing to fully capture the bidirectional interaction between universities and communities (Hsing & Huang, 2023). Internationally, particularly in Europe, the development of USR began earlier. Universities have actively engaged with global challenges such as climate change and social inequality through the promotion of USR, emphasizing collaboration with communities to explore joint solutions (Coelho & Menezes, 2020; Hsing & Huang, 2023; Landholm et al., 2019).

In contrast, Taiwan's USR initiatives remain predominantly university-centered, and deep collaboration with communities has yet to be fully realized. Existing research largely focuses on "what the university has done," while discussions on "how to work together with the community" are still insufficient (Hsing & Huang, 2023).

The Innovative Integration of Micro-Courses in General Education and CBT

General education aims to cultivate students' holistic development, promoting a balanced growth in knowledge, skills, and attitudes to address complex social issues (Antiado et al., 2020; Ye et al., 2022) As an innovative form of general education, micro-courses are

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characterized by their high flexibility and concise content, providing students with efficient learning experiences within a short period of time (Bangor et al., 2023) In Taiwan, micro-courses have become an essential component of general education, with many universities integrating them as a core element of curriculum design. These courses cover both traditional and interdisciplinary topics, helping students adapt to a rapidly changing social environment (Chiu, 2018). The versatility of micro-courses allows them to be delivered in various formats, making it possible to create a novel model by integrating them with Community-Based Tourism (CBT). Given that CBT is characterized by community-led initiatives, the preservation of local culture, the promotion of environmental sustainability, and the enhancement of community well-being (Balen et al., 2024; Kurniadinata & Suhartini, 2024), this combination enriches students' learning experiences and understanding of community needs, while also fostering close collaboration between universities and communities.

An Innovative Model of Education and Social Practice

This study explores the integration of University Social Responsibility (USR), micro-courses in general education, Community-Based Tourism (CBT), and Participatory Action Research (PAR) to create a unique model of education and social practice. While this approach is rarely discussed in the current literature, this study believes it holds significant value for multiple reasons.

Firstly, USR, as a core concept for universities in responding to societal needs, emphasizes that universities should be not only disseminators of knowledge but also active agents of social change (Sharmil et al., 2021; Snapp et al., 2023; Hall Moran et al., 2023). However, traditional USR practices often center on the university itself, lacking deep interaction with the community (Hsing & Huang, 2023). By integrating micro-courses, this model changes the dynamic. Micro-courses provide a flexible and targeted learning platform that allows students to acquire critical knowledge and skills in a relatively short time and apply them in real-world social contexts. This not only enhances students' learning outcomes but also promotes their active participation in social issues, embodying the true spirit of USR.

Secondly, micro-courses play a crucial role in the practice of USR. These flexible and efficient courses enable students to quickly master diverse knowledge and skills, which they can then apply in real social situations, thereby enhancing their understanding of and engagement with societal issues (Bangor et al., 2023). When combined with CBT, micro-courses can cover a wide range of areas, including religion, culture, history, and ecology, deepening students' understanding of community needs, promoting their participation in local economic and cultural preservation, and bridging the university with the community to achieve sustainable development.

Finally, PAR emphasizes the collaborative partnership between researchers and community members (Sharmil et al., 2021), providing a solid theoretical foundation for the integration of USR, micro-courses, and CBT. Through PAR, universities can not only better understand community needs but also co-design and implement solutions with the community. This bidirectional interaction not only fosters students' sense of social responsibility but also ensures the sustainability and effectiveness of university-community collaboration.

The integration of University Social Responsibility (USR), micro-courses, Community-Based Tourism (CBT), and Participatory Action Research (PAR) forms an innovative educational model that addresses the lack of mutual engagement between universities and communities, enhancing their role in sustainable development. This study examines how universities can shift from isolated actors to active community partners. By designing micro-courses and using participatory methods, the model improves student outcomes and promotes meaningful collaboration with communities. The research aims to explore how this approach

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fosters enduring partnerships and identify key success factors, positioning universities as active agents in global sustainability rather than mere knowledge providers.

Specifically, this study sought to explore the following questions based on the in-depth community practice experience of National Chiayi University:

How can the integration of USR and general education enhance students' sense of social responsibility? This includes the design and implementation of micro-courses combined with community-based tourism to enhance students' understanding and active engagement with social issues.

How can universities and communities advance deep collaboration? By analyzing the practical process, this study aims to provide important references for future practitioners and researchers.

What factors contribute to successful collaboration between universities and communities? This study will examine the key success factors in the long-term and deep collaborative process between National Chiayi University and the community.

Research Methodology

Design

This study employed Participatory Action Research (PAR) as its primary research methodology. The core of PAR lay not only in problem-solving but also in emphasizing the collaborative participation of all community stakeholders throughout the research process (Sharmil et al., 2021). Additionally, PAR involved an iterative process of continuously adjusting and optimizing strategies to ensure that the actions taken genuinely reflected the unique needs and characteristics of the community (Snapp et al., 2023; Woelders & Abma, 2019), with the ultimate goal of fostering social change (Hall Moran et al., 2023; Sharmil et al., 2021; Snapp et al., 2023).

This study specifically focused on the practical challenges encountered during the process of community collaboration. Over the past two years, the research team deeply engaged with the community, working alongside residents to co-design and implement micro-courses centered on Community-Based Tourism (CBT). In the research design, this study utilized multiple cycles of action, including planning, execution, reflection, and revision, to gradually develop a teaching model that was well-suited to the actual conditions of the community. This approach not only facilitated collaboration between the community and the university but also provided students with more concrete and actionable learning experiences. The design and implementation of the courses fully embodied the theoretical framework of PAR, and the choice of this research method helped clarify the core processes of this study, offering valuable insights for future related research. The study's methods are suitable for resource-limited settings requiring long-term community engagement, providing references for addressing community development challenges.

Participants

The action research team consisted of two main categories of members: the university team and the community partners, with a total of ten members:

University Team Members: There were seven members in this group. The first member served as the executive director of the HISP project at National Chiayi University, under the National Science and Technology Council. This person is a university professor with expertise in education, responsible for leading and making decisions for the entire action plan (referred to as Member One). The second member, also a university professor, served as the project executive

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secretary with a background in community psychology, tasked with coordinating and advancing the project (referred to as Member Two). The team included three postdoctoral researchers who were responsible for on-site implementation, planning, executing, and promoting the project. Their areas of expertise included tourism, geography, and the history of education (referred to as Members Three, Four, and Five). Additionally, there were two full-time project assistants with expertise in tourism and the arts, as well as administrative experience, who were responsible for the administrative aspects of the project (referred to as Members Six and Seven).

Community Partners: This group consisted of three members. The first two members had lived in the community for over forty years and were among the earliest community members to form partnerships with the university team (referred to as Partner One and Partner Two). Partner One had experience as a community tour guide and worked in the tourism industry, while Partner Two was the main operator of a community gathering place, with extensive connections within the community. The third member was the only local community partner running a tourism business (referred to as Business Partner One), who had a strong sense of community awareness but, as a small business owner, required diverse support from partners.

In PAR, it is important to clarify the roles throughout the process, particularly in distinguishing between initiators and supporters, as well as researchers and practitioners:

Initiators and Supporters: In this action plan, the university played the role of initiator due to its mission to deeply engage in University Social Responsibility (USR) and innovate general education. The university also acted as a supporter, receiving manpower and budgetary support from the National Science and Technology Council and the university itself. However, the community partners were not passive participants; they were also initiators, driven by the need for sustainable development, innovative community economics, cultural preservation, and increased community vitality and visibility. Lacking the necessary human resources, they required the involvement of the university team. Community partners contributed essential resources such as local knowledge, cultural awareness, and personal networks, which were crucial to the successful implementation of USR in the community. Thus, the community also played a supportive role.

Researchers and Practitioners: Within this action plan, the university team's postdoctoral researchers were directly responsible for research, which required them to be stationed in the community long-term, conducting in-depth observations, interviews, and data analysis. They were primarily responsible for research design, data collection, and result analysis, representing the typical researcher role. As for practitioners, the community partners, along with the university's postdoctoral researchers and full-time assistants, were directly involved in the action cycles, making them active participants in the practical implementation. The other university team members, who also had university duties and day-to-day responsibilities, played a supporting role in the practical aspects of the project.

Setting and Participants

The Haomei area boasts a history of nearly 400 years, having once been the entrance to the Dao-feng Inland Sea in the 16th century. Its strategic geographical location attracted pirates, merchants, and immigrants vying for control. Over time, due to multiple changes in the river's course, the inner sea vanished, leading to significant transformations in the area's natural environment and cultural history. Today, Haomei is rich in cultural and ecological resources, including the Ming Dynasty Mazu Temple and a nationally recognized wetland. The community has also been recognized for its self-initiated beach conservation efforts, which have been ongoing for nearly a decade and have won multiple awards, demonstrating the area's significant potential for sustainable community-based tourism (CBT). In recent years, the region has become a popular tourist destination due to the emergence of a painted village and social

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media hotspots, but this surge in tourism quickly faded due to a lack of sustainable planning. Nevertheless, the residents continue to hope that tourism can revitalize the local economy and community vitality. In response, the university team collaborated with the community, integrating University Social Responsibility (USR) and general education practices with the concept of sustainable CBT. Together, they developed a one-day micro-course that explores Haomei, aiming to provide students with a comprehensive experience of the community's culture, history, geography, industries, religion, and sustainability efforts. The goal is to foster students' cultural awareness and attention to social issues, while also enhancing community participation and empowerment, thereby creating opportunities for fair benefit distribution as a concrete action of USR.

The participants in this action research were primarily students enrolled in the "Discovering Chiayi" Micro-Courses at National Chiayi University. This course is part of a newly established general education series, created in September 2022, with the goals of promoting sustainability, innovation, localization, and fulfilling the university's social responsibility. The course is centered around four main themes: mountains, seas, cities, and campuses of Chiayi, offering more than ten micro-course routes. The participants were mostly undergraduate students from first-year to final-year, with the option to enroll in up to four micro-courses. Each route consists of 9 hours of coursework, and students can earn 0.5 credits per route, with a maximum of 2 credits. The university expects that students, after completing these courses, will develop a sense of local care and sustainability awareness. The course was offered once each semester over three semesters from September 2022 to June 2024, with a total of 78 participants from 28 different departments. This research utilized both qualitative and quantitative feedback from the participating students as one of the research bases to verify the course's effectiveness and the achievement of its objectives.

Data Collection and Analysis

This participatory action research primarily employed qualitative analysis, focusing on thematic analysis of the action plan's development and implementation, supplemented by quantitative analysis. The focus of the qualitative analysis was on documenting the process of constructing and implementing the action plan by the action team over the course of two years. The data sources mainly included records of discussions and reflections between the team and community partners, as well as qualitative data from student feedback questionnaires (as shown in Table 1). For qualitative analysis, this study adopted the constant comparative method (Glaser & Strauss, 1967). This involved repeatedly reading the raw data, identifying significant phrases, and extracting concise key phrases. This study then iteratively reviewed these key phrases, grouping similar phrases into subthemes, and subsequently abstracting higher-level themes based on the relationships between the subthemes. Finally, by repeatedly cross-examining the various data categories, this study refined the relationships between the themes, forming the highest-level categories, which constituted the basic framework for writing the research report. The quantitative data, derived from the results of quantitative questions in student questionnaires, were used to support the interpretation of the qualitative data.

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Table 1
Summary of Qualitative Data Management Codes

Data Source	Coding Method	Example
Field Notes	Notes-Date-Subject	Notes-2022-10-19-Partner Two
Weekly Meeting Report Records	Weekly Report-Date-Subject	Weekly Report-2023-6-6-Member Two
Participation in Micro-Course Satisfaction Survey	Satisfaction Survey-Survey Date	Satisfaction Survey-2023-5-6
Community Awareness Questionnaire	Community Awareness Questionnaire-Survey Date	Community Awareness Questionnaire-2023-10-20
Learning Effectiveness Questionnaire	Learning Effectiveness Questionnaire-Survey Date	Learning Effectiveness Questionnaire-2024-3-30

Data Reliability

The reliability of the data in this study was ensured using triangulation, as employed by Dymond et al. (2006) in participatory action research, to guarantee the trustworthiness of the research findings. This study conducted cross-verification through multiple data sources and different coders. For the consistency reliability analysis of qualitative data, the initial coding was performed by the primary researcher. Subsequently, a research assistant randomly selected one-third of the data from each source for consistency coding checks. Any discrepancies that arose during the coding process were discussed between the researcher and the research assistant to reassess and clarify the appropriateness of the coding. This approach was implemented to ensure consistency and accuracy in data analysis.

Research Results

The Process of Constructing and Implementing the Action Plan

This action plan was developed through collaboration with local residents to create general education micro-courses grounded in sustainable tourism principles. The courses, centered around community-based tourism (CBT), addressed topics such as religious beliefs, industrial culture, cultural history, and natural ecology, with an emphasis on active participation in sustainable practices. These micro-courses aimed not only to enhance university students' learning experiences but also to foster early-stage interactions and collaborations between the project team and residents.

According to the World Tourism Organization, sustainable tourism considers economic, social, and environmental impacts, addressing the needs of visitors, the industry, the environment, and host communities (UNWTO, 2017). CBT, a sustainable tourism form, highlights local residents' leadership in tourism planning and management, ensuring equitable benefit distribution and supporting local economic growth. It prioritizes cultural and natural resource preservation, limits overdevelopment, and promotes environmental awareness. CBT fosters sustainability by enhancing cultural exchange and strengthening community identity and pride. These principles shaped the foundation of this study action plan.

The planning process of this prototype action plan followed the six stages outlined in the systematic tourism planning model by Gunn (1994), which provides a structured approach to effective tourism development.

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1. Setting Objectives, this study action steps were as follows:

(1) This study initially discussed implementing CBT principles during team meetings, continuously reminding each other throughout the process. For example: "Tai Sheng Temple has a long history of 400 years, and having the temple staff conduct the tours would be the best way to showcase it. However, they have limited experience in guiding university groups and may not know how to start, so some training might be necessary. Although it will take time to persuade them to participate, this is an essential step in implementing the principle of community participation, and it's something this study needs to do." (Weekly Report-2022-10-31-Member Two). This study needs to assess whether the community, after experiencing a rapid rise and fall in popularity, is committed to pursuing sustainable, long-term development. Through discussions with residents, this study confirmed their support for this vision. For instance, a local business owner noted in a casual conversation that. 'We were Taiwan's first 3D painted village, but as long as someone can paint and a village is willing to be painted, similar tourist spots can emerge. Our tourist flow dissipated in less than two years, but I truly believe that our natural and cultural resources, along with our sustainability efforts, are second to none. I hope that through this initiative, we can find a lasting and suitable direction for developing tourism again.'" (Field Notes-2022-10-28-Business Partner One).

(2) Collected Villagers' Opinions: We gathered collaborative opinions through formal meetings, including pre-project consultations with community leaders, and informal consultations during implementation. By being stationed in the village, this study engaged in conversations with residents to gather valuable insights on development. For example, "Our windbreak forest is beautiful. Inside the forest, there is a small lake with fallen trees, and when the blue sky reflects on the water, it creates a stunning view. The villagers refer to it as a hidden gem. We have more to offer than just the painted walls in the village; we have many resources that can be developed for tourism." (Field Notes-2022-10-19-Partner Two)".

(3) Team Member Discussions: Stationed partners attended weekly office meetings and monthly project meetings, sharing information gathered from the community. These discussions helped adjust approaches and build consensus on the community practice plan. "Based on the feedback gathered this week, there is a strong consensus within the community about redeveloping tourism. However, the key challenge moving forward is how to transform them from storytellers into our partners" (Weekly Report-2022-10-31-Member One).

2. Data Collection and Analysis, the steps taken during this phase are outlined as follows:

(1) Data Collection and Preliminary Research: Before entering the community in July 2022, this study collected information on Haomei's resources, conditions, and heritage through various sources. In September, this study reviewed the cultural history, producing a key document for understanding the local context.

(2) Site Visits: To verify the preliminary research and assess tourism potential, this study visited the key people, places, events, and objects mentioned in the texts and discussed with community partners the feasibility of including these elements in the tour planning. For example, one partner noted… "The legendary pirate treasure site is currently a cemetery in the wilderness, and there are actually some local taboos about entering the area, so it might not be suitable for students to visit yet." (Field Notes-2022-09-20-Partner Three)

(3) Analysis and Discussion: In planning the micro-course in September 2022, this study analyzed the collected data, observations, and community partners' opinions, assessing the current conditions and limitations of various resources. For example, one partner remarked "Digging for clams is something locals did a lot when they were kids. Visitors

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usually just eat clams but never know that clams live in the sand and have to be dug out." (Field Notes-2022-10-26-Partner One); another partner added, "Since digging for clams requires some skill, visitors often have a lot of fun once they learn how. Clams are especially abundant in the intertidal zone, but it's only safe to go in during low tide, so we need to consider the tide schedule in our planning." (Field Notes-2022-11-02-Business Partner One); another observation was, "The village roads are mostly narrow lanes, making it difficult to navigate with a large bus, but we've been getting in and out of here for over 40-50 years, so we know the best and safest routes." (Field Notes-2022-01-26-Partner Two).

3. Synthesis: The steps taken in this phase are outlined as follows:

(1) Confirmation of Course Specifications: To ensure tour quality and comply with the regulations and budget set by the university and the National Science and Technology Council, as well as bus capacity limits, this study capped the number of students at 35, establishing a clear framework for itinerary design.

(2) Community Resources Availability: this study investigation confirmed that the community, with its 400-year history, offers rich natural, cultural, and industrial resources suitable for a 9-hour student learning experience. Community partners provided support, including venues, seating, refreshments, restrooms, aquaculture observations, and guided tours, secured through their local connections. With these resources confirmed, this study moved to the creative planning phase.

(3) Creative Conceptualization: To deepen students' understanding of local knowledge and foster cultural care, this study designed a one-day community experience focused on nature, culture, religion, industry, and sustainability, distinct from typical tours. The experience had two features: tours led by community partners to enhance authenticity, with locals sharing their stories, and hands-on activities like traditional clam harvesting and community-led beach conservation efforts, including driftwood removal, planting vegetation, and beach cleanups.

4. Policy and Plan Formulation:

(1) Policy Direction: Focusing on University Social Responsibility (USR) and general education, this initiative involves designing micro-courses on Community-Based Tourism (CBT) through collaboration between the university's team and local residents. Courses will explore local beliefs, industrial culture, history, and ecology, and promote sustainable actions. The goals include enriching student learning, enhancing social awareness, fostering university-community cooperation, and supporting cultural preservation, community tourism, and sustainable resilience.

(2) Plan Formulation: Based on the context described above, this study developed the following plan (as shown in Table 2), which has been approved by the university for recruiting students to participate in the micro-courses.

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Table 2
Community Tourism One-Day Tour Product Content

Tour Name	Tour Content
Budai Haomeili Exploration: One-Day Tour	Unit 1: Coastal Community Religious Pilgrimage (3 hours) Discover Wanggang Tai Sheng Temple, home to Taiwan's only Mazu statue certified as a National Historic Relic, explore coastal Wangye beliefs, and enjoy free exploration of the village's landmarks, including Five Camps, Jiatou Temple, and 3D murals.
	Unit 2: Coastal Community Ecological Tour (3 hours 40 minutes) Learn about the windbreak forest ecosystem, Haomei Beach's conservation efforts, and participate in sustainable beach conservation activities.
	Unit 3: Coastal Community Industry Tour (2 hours 20 minutes) Explore cultural and creative industries, visit boat houses, tour natural seawater tidal aquaculture facilities, and engage in industry experience activities.

Implementation (July 2022 - June 2024): The course was implemented three times with full enrollment each time, following a cycle of implementation, review, re-planning, and re-implementation, in collaboration with key community stakeholders:

(1) Local Knowledge Collection: Community members contributed oral histories and local books, while university experts verified and curated data from historical, geographical, and forestry perspectives.

(2) Data Integration and Digital Preservation: Digital content design experts managed the integration, digital preservation, web design, database creation, and the design of guides and souvenirs.

(3) Tourism and Educational Value Extraction: University experts in tourism and education extracted valuable information, planned itineraries, and conducted marketing and guide training.

(4) Logistical Support: The project office managed logistics, including food, transportation, and necessary tour support.

(5) Guiding and Interpretation: Community residents and local tourism operators led the guiding and interpretation based on their expertise.

(6) Product Coordination and Promotion: Postdoctoral researchers and project assistants with tourism expertise coordinated and promoted the overall product development and implementation.

(7) Monitoring and Evaluation: Continuous monitoring and evaluation were conducted to ensure the course met its objectives, with adjustments made as needed. Key tools included post-experience questionnaires: Micro-Course Satisfaction: Participants rated their satisfaction with the tour on a 5-point Likert scale, from "Very Satisfied" to "Very Dissatisfied". "Community Awareness: Assessed students' understanding of community aspects such as culture, history, and ecology, with responses categorized as "Yes," "Average," or "No. "Learning Effectiveness: This questionnaire assessed the micro-course's impact on credit accumulation, learning motivation, broadening of learning fields, and course flexibility. Responses were recorded on a five-point Likert scale, ranging from "Strongly Agree" to "Strongly Disagree," with 5 being the highest score.

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Feedback from Students and Community Partners

1. Student Feedback

Quantitative Feedback: A total of 78 participants from 28 departments provided feedback across three course implementations, showing changes in satisfaction and learning effectiveness over time (statistical tables in the appendix):

(1) Micro-Course Satisfaction: The average score was 4.72/5, peaking at 4.79 in May 2023. Scores slightly declined to 4.77 in October 2023 and 4.61 in March 2024, indicating a gradual drop in satisfaction.
(2) Community Awareness: On average, 90% of participants answered "Yes" to awareness questions. Geographical awareness reached 100% in two surveys, while cultural awareness improved from 83% in May 2023 to 93% in March 2024, showing steady progress.
(3) Learning Effectiveness: The overall score was 4.75/5, peaking at 4.85 in May 2023, then slightly decreasing to 4.63 in October 2023 and March 2024. Despite positive outcomes, the slight decline suggests a need for instructional adjustments to sustain engagement.

Qualitative Feedback: Students highly valued hands-on activities like clam digging and marine debris removal, which increased environmental awareness and provided a sense of accomplishment. The Tai Sheng Temple tour deepened their interest in local culture and the Taiwanese language. Feedback highlighted the impact of weather, break scheduling, and outdoor activity timing. Interactions with residents offered insights into the fishing village lifestyle, inspiring students to engage more with community life and seek further immersion opportunities (Appendix Table 4).

2. Feedback from Community Partners:

Community partners provided valuable feedback on the course design, implementation, and collaboration experience, which contributed to the course's success. They appreciated the unique approach, allowing students to engage deeply with the community's forest, beach, and temple, and participate in long-term beach conservation efforts. However, some partners noted that the heat affected student participation and suggested adding more water stations. While partners enjoyed the collaboration, some guides expressed the need for additional training to better share community stories. Overall, partners felt respected and valued the university's respect for their customs and beliefs, highlighting the need for ongoing course improvements and stronger community collaboration (see Appendix Table 5 for detailed feedback).

3. Challenges in Recruiting Community Partners:

While recruiting community partners, this study faced challenges with low participation. For example, one resident noted: "Making money is important to us; we rarely do things just because they are 'meaningful'" (Field Notes-2022-10-19-Partner Two). This mindset reflects uncertainty about the future, with residents prioritizing production and capital accumulation. To address this, this study implemented two strategies: This study began with residents aligned with the university's values, using them to promote goodwill and invite like-minded individuals to join. This study used the "Do, Observe, Disseminate, Invite" (D.O.D.I.) strategy—acting first, observing reactions, sharing information, and repeatedly inviting collaboration. This approach gradually led to significant changes.

"To be honest, I wasn't sure about your intentions at first. I didn't think something so good could just come to our community out of nowhere. But seeing your careful planning and the fact that you brought in students, and not just once, I was really moved. So, I decided to join and see what I could contribute." (Field Notes-2024-6-7-Partner One). "In fact, the community

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is gradually becoming more interested in what you're doing. For example, some residents have brought free water for the students, and there are discounts on food and drinks at local shops. They've been touched by your efforts and wanted to say thank you." (Field Notes-2024-6-7-Partner Two). "I've supported you from the beginning, but many people in the village still don't understand your good intentions. Whenever I get a chance at our gatherings, I talk about your plans to increase awareness and get more people involved in this good work." (Field Notes-2024-6-28-Partner Three).

Discussion

Based on this study experience from this action research, this study identified five key factors that contributed to successful collaboration with community partners. These factors have established a solid foundation for university-community cooperation and continue to promote the successful implementation of the course:

1. Building Trust:
   Studies by Sanna et al. (2024), Hifdzi and Tukiman (2023), and Riyanto and Supriono (2023) emphasize the importance of building trust at the outset of collaboration. This study's findings supported this, revealing that through prolonged interaction and communication, community partners gradually came to understand and trust the intentions and capabilities of the university team. This trust motivated them to invest time and resources and actively participate in the design and execution of the course. For example, after implementing this study's partner recruitment strategy, as the community increasingly recognized the sincerity and efforts of the university team, their initial doubts were gradually dispelled, which led to active participation and support.
2. Shared Goals:
   Prasetyo and Asmara (2024) highlighted that establishing shared goals is essential for effective collaboration between community partners and university teams. This aligned with our findings, as both parties in this course design had agreed on principles such as sustainable development, local characteristics, mutual cooperation, and enhancing students' understanding of community issues. They shared the vision that a course designed around community tourism could promote community development and cultural preservation while advancing the practice of university social responsibility and general education.
3. Continuous Communication and Feedback:
   Weekly and monthly meetings allowed the team and community partners to regularly share progress, discuss issues, and propose solutions. This continuous communication ensured the smooth progress of the course and enabled timely resolution of any challenges. The importance of ongoing communication and feedback for smooth collaboration during course implementation was supported by Silva (2023) and Prasetyo and Asmara (2024).
4. Resource Sharing and Collaboration:
   The sharing of resources and collaboration during course design and implementation was another critical factor for success, as noted in studies by Prasetyo and Asmara (2024) and Riyanto and Supriono (2023). Community partners provided rich local resources, such as natural landscapes, cultural heritage, and human stories, along with essential local support, which aligned with the findings of these studies. This study also found that the university team contributed professional knowledge and technical assistance. By sharing resources and collaborating, both sides successfully completed the course design and implementation.
5. Flexibility and Innovation:
   Strategies involving flexibility and innovation were crucial in addressing challenges during implementation, as proposed by Sitikarn (2021) and Yuliane and Sholeh (2022). As discussed in the previous section on implementation, these strategies led to positive outcomes, such

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as enhanced student learning efficiency, increased community participation, and enriched university practice experience. These findings aligned with the scholars' emphasis on the importance of flexibility and innovation.

Although the existing literature provided limited discussion on how universities engage deeply in community practices, this study addressed this gap by offering concrete practical experiences based on these five key factors. These experiences, supported by partners' reactions and actions, provide substantial evidence for future university-community collaboration practices and enrich the theoretical framework.

Furthermore, the educational significance of our findings is closely tied to an international perspective. For instance, Birzina and Kalnina (2023) emphasized the importance of fostering inquiry-based thinking and collaboration skills to tackle complex real-world challenges. Määttä and Uusiautti (2016) pointed out that learning environments and motivation are critical to student success, which aligned with these study findings on the positive impact of integrating community resources to enhance student motivation. Chao (2023) underscored the value of resource sharing and practical activities, which further supported this study emphasis on the educational and societal benefits of such collaborations. Additionally, Kronberga and Bite (2010) discussed how university social responsibility extends beyond academic knowledge to include active community engagement and sustainable societal impact, which paralleled this study approach of using micro-courses to promote community development. These international studies provide a strong foundation for this study, enriching the theoretical framework and offering new perspectives for university-community partnerships worldwide.

Conclusions and Implications

This study successfully created a highly synergistic model of education and social practice by integrating University Social Responsibility (USR), general education micro-courses, Community-Based Tourism (CBT), and Participatory Action Research (PAR). Through two years of collaboration, National Chiayi University and the local community achieved a deep integration of community development and student learning by repeatedly implementing, reflecting on, and adjusting the program.

The study not only identified five key factors–building trust, shared goals, continuous communication and feedback, resource sharing and collaboration, and flexibility and innovation–that are critical to the successful practice of USR but also compiled practical processes, particularly the lessons learned from multiple action cycles, which are of significant reference value for future practitioners. Whether in the university's promotion of social responsibility or in specific actions in collaboration with the community, this research provides a clear operational framework and implementation pathway, laying the foundation for future practitioners and researchers.

This study has several limitations that should be considered cautiously when interpreting the results. First, the sample size and geographic focus may limit the generalizability of the findings. Second, while the two-year study period allowed for the observation of short-term effects, the long-term impact has not yet been fully validated. Third, the depth and breadth of community participation varied, and some members' needs were not fully reflected, affecting the comprehensiveness of the conclusions. Additionally, the application of the PAR methodology presents challenges in balancing power dynamics and subjectivity, which may influence the objectivity and applicability of the results. Finally, the study relied on specific resources and external conditions, which may not be replicable in other contexts. Future research should explore these limitations in greater depth to enhance the generalizability and applicability of the findings.

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Implications

The findings of this study have important implications for both researchers and practitioners engaged in university-community collaborations:

1. For Researchers:
   Strengthen University-Community Collaboration Mechanisms: Future research should explore ways to optimize university-community collaboration models, emphasizing sustainability and expanding these practices to diverse settings.
   Expand the Scope of Micro-Course Topics: Researchers are encouraged to design micro-courses that address current social issues, building on the practical experiences of this study to promote meaningful social engagement among students.
   Promote the Methodology of Participatory Action Research: The detailed steps and strategies of the PAR methodology outlined in this research can serve as a guide for driving social innovation and change in various fields.
2. For Practitioners:
   Enhance Community Engagement and Empowerment: Practitioners can draw from the experiences compiled in this study to foster a sense of participation and empowerment among community members, ensuring projects deliver tangible benefits to local residents.
   Adapt Flexibly to Challenges in Practice: The analysis of challenges and solutions provided in this study serves as a resource for practitioners to navigate unforeseen situations, facilitating project success and goal achievement.
   Establish Continuous Feedback and Improvement Mechanisms: Practitioners should implement the feedback mechanisms suggested in this study, regularly assessing and refining project progress to maximize effectiveness and impact.

The study's broader international relevance lies in its framework for university-community engagement, particularly in the context of sustainable development and cultural preservation. The identified factors of trust, shared goals, continuous communication, resource sharing, and flexible strategies can serve as a model for universities worldwide. As higher education institutions increasingly focus on social responsibility, this research contributes to global discussions on how universities can collaborate effectively with local communities to enhance student learning and support sustainable community tourism.

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Appendices

Table 1
Micro-Course Participation Satisfaction Survey

Question	Very Satisfied	Satisfied	Neutral	Unsatisfied	Very Unsatisfied	Total Participants	Average Score	Tour Date
How would you rate the overall experience of the tour you participated in?	19	3	1	0	0	23	4.79	2023/5/6
	22	5	1	0	0	28	4.77	2023/10/20
	17	9	1	0	0	27	4.61	2024/3/30
Total	58	17	3	0	0	78	4.72	

Table 2
Statistics of Community Awareness Questionnaire for Micro-Course Participants

Question	Date	Yes	Average	No	% Yes	Total
After attending this course, has your understanding and knowledge of the following aspects of this route improved?						
Humanities Aspect	2023-5-6	20	3	0	87	23
Historical Aspect		22	1	0	96	23
Geographical Aspect		23	0	0	100	23
Ecological Aspect		22	1	0	96	23
Industrial Aspect		22	1	0	96	23
Community Development Aspect		21	2	0	91	23
Cultural Aspect		19	4	0	83	23
Subtotal		--	--	--	94	--
Humanities Aspect	2023-10-20	27	1	0	96	28
Historical Aspect		26	2	0	93	28
Geographical Aspect		27	1	0	96	28
Ecological Aspect		27	1	0	96	28
Industrial Aspect		24	4	0	86	28
Community Development Aspect		24	4	0	86	28
Cultural Aspect		24	4	0	86	28
Subtotal		--	--	--	91	--

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Question	Date	Yes	Average	No	% Yes	Total
After attending this course, has your understanding and knowledge of the following aspects of this route improved?						
Humanities Aspect	2024-5-30	24	3	0	89	27
Historical Aspect		26	1	0	96	27
Geographical Aspect		27	0	0	100	27
Ecological Aspect		26	1	0	96	27
Industrial Aspect		26	1	0	96	27
Community Development Aspect		25	2	0	93	27
Cultural Aspect		25	2	0	93	27
Subtotal		--	--	--	95	--
Overall Average			90			
Total Participants			78			

Table 3
Statistics of Learning Effectiveness Questionnaire for Micro-Course Participants

No.	Question Content	2023-5-6	2023-10-20	2024-5-30
		Average Score		
1	Taking micro-credit courses allows you to earn credits while studying topics of personal interest.	4.86	4.81	4.8
2	Taking micro-credit courses increases my motivation to learn.	4.81	4.70	4.52
3	Taking micro-credit courses helps broaden my learning scope and increases diversity.	4.9	4.78	4.5
4	The flexible schedule of micro-credit courses enhances my willingness to learn.	4.81	4.78	4.54
5	Overall, micro-credit courses have had a positive impact on my learning outcomes.	4.86	4.74	4.4
Subtotal		4.85	4.76	4.63
Total		23	28	27
Overall Average			4.75	

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Table 4
Summary of Student Feedback

Category	Subcategory	Specific Feedback
Course Experience and Learning Outcomes	Clam Digging Activity	"Digging for clams was a unique experience, and I felt a great sense of accomplishment after finding some." (Satisfaction Survey - 2023-5-6), "The clam digging part was really fun, especially since we got to take some home." (Learning Effectiveness Survey - 2023-5-6),"This was my first time clam digging, and I not only learned something new but was thrilled to actually dig up clams myself." (Community Awareness Survey - 2023-10-20)
	Sustainable Actions	"Clearing marine debris from the oyster farm was meaningful as I felt I was contributing to our land's wellbeing." (Learning Effectiveness Survey - 2024-3-30),"I really enjoyed helping to clear the wooden debris from the beach; it felt like I was doing something good for the environment, which was very satisfying." (Satisfaction Survey - 2023-5-6), "Participating in the marine debris cleanup not only taught me the importance of environmental protection but also made me feel like I did something beneficial for the environment, which made me feel good." (Community Awareness Survey - 2023-10-20)
	Tai Sheng Temple Guided Tour	"I really enjoyed listening to the elder explain the history at Tai Sheng Temple, especially since the entire tour was conducted in Taiwanese, which was very exciting!" (Learning Effectiveness Survey - 2024-3-30),"The guided tour at Tai Sheng Temple was fascinating, especially the use of Taiwanese, which gave me a deeper understanding of the local history and culture." (Satisfaction Survey - 2023-5-6),"The cultural explanation at Tai Sheng Temple helped me understand the history and beliefs of the area, which was very worthwhile." (Community Awareness Survey - 2024-3-30)
Course Arrangement and Suggestions	Course Arrangement	"When the weather is hot, I hope there will be more shaded areas or adjustments to the activity schedule." (Community Awareness Survey - 2023-10-20),"I hope there will be more break time during the activities, especially when it's hot." (Learning Effectiveness Survey - 2024-3-30),"The weather was too hot; I hope for more shaded areas." (Satisfaction Survey - 2023-5-6) ,"When it's hot, consider shortening the outdoor activities." (Satisfaction Survey - 2023-5-6),"Outdoor activities could be scheduled during cooler times of the day for a better experience." (Learning Effectiveness Survey - 2023-3-30)
	Suggestions for Extending Activity Time	"The free time at the beach was too short; I wish we could have stayed longer." (Learning Effectiveness Survey - 2024-3-30), "The beach is so beautiful; I hope to spend more time there next time." (Satisfaction Survey - 10-20)
	Language Comprehension Difficulties	"The guided tour at Tai Sheng Temple was interesting, but since it was all in Taiwanese, I didn't understand some parts." (Learning Effectiveness Survey - 2024-3-30)
Rural Life Experience and Resident Interaction	Fishing Village Life Experience and Resident Interaction	"I've lived in the city all my life, and coming to Chiayi for school, I thought rural life would be boring, but today's course made me realize Chiayi is a very interesting place." (Satisfaction Survey - 2023-10-20),"During free exploration, I chatted with an elderly lady digging for oysters and an old man praying at the temple. Their lives seemed so different from mine, and I learned a lot." (Satisfaction Survey - 2023-5-6)
Willingness to Continue Participation	Willingness to Continue Participation	"Is there a chance to work here during the summer? I want to experience more of the community life." (Satisfaction Survey - 2023-5-6)

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Table 5
Feedback from Community Partners

Category	Feedback
Feedback on Course Design and Content	"This time, it's different from the usual tourist groups that just come to take pictures of our 3D murals and then leave. They visited our forest, beach, and temple, and even talked with our elders in the village. This is a very good arrangement." (Field Notes-2023-5-6-Partner One)."It's great that students could participate in the beach protection work we've been doing for nearly ten years, letting them experience the hard work and significance of it." (Field Notes-2023-5-6-Business Partner One)."Our windbreak forest is beautiful and closely connected to our lives. It was good that a forestry graduate student explained it, but the content was very technical. I wonder if it was too difficult for everyone to understand?" (Field Notes-2023-5-6-Partner Two).
Feedback on Course Implementation	"Some students didn't seem interested in the experiential and exploratory parts of the course, like the community, forest, beach, and clam digging. Most of them just stayed in one place and watched, not really wanting to participate. I think it was because it was too hot?" (Field Notes-2023-10-20-Partner Two). "It was really hot, and the water we brought and the extra water we provided were all used up at the outdoor locations. We should set up more water stations and provide more water." (Field Notes-2023-10-20-Partner One).
Feedback on the Collaboration Experience	"You respected our customs and beliefs, and we could discuss our suggestions. This is very different from what we originally thought of universities, and it has been a very pleasant collaboration." (Field Notes-2023-10-20-Partner Two). "It's great that we got to be the guides, but some of us have experience, and some don't. We also don't know what the students like to hear, and we're unsure if what we're saying is correct. We hope we can receive more training." (Field Notes-2023-5-6-Partner One).

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PROMOTING SUSTAINABLE TEACHER DEVELOPMENT: THE IMPACT OF ONLINE LESSON STUDIES ON REFLECTIVE PRACTICES

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Abstract

Reflective practice is essential in teacher education, enabling pre-service teachers to engage in meaningful professional development and continuously improve their teaching skills. However, barriers such as time constraints, geographic isolation, and crises like COVID-19 often hinder consistent engagement in reflective practices. This study developed and evaluated an online lesson study platform within a university-based teacher education program to address these challenges and support pre-service teachers' professional growth. Using a mixed-methods approach, the study analyzed reflective engagement among 115 pre-service teachers in the Faculty of Education through reflection reports and surveys. The theoretical framework, based on Darling-Hammond's reflective perspective, focused on student learning processes, teaching effectiveness, classroom atmosphere, personal educational philosophy, and continuous growth through reflective dialogue. Qualitative analysis revealed varying levels of engagement in reflective practices, with significant improvements in reflections on teaching methods and student learning. However, challenges remained in reflecting on students' cognitive processes. Quantitative analysis using the McNemar test confirmed statistically significant increases in reflective practice engagement. These findings suggested that online lesson study platforms can provide accessible and practical opportunities for pre-service teacher professional development, overcoming barriers related to location and logistics and supporting global educational goals, particularly Sustainable Development Goals 4 (Quality Education) and 10 (Reduced Inequalities).
Keywords: *lesson study, peer collaboration, professional development, reflective practices, teacher education*

Introduction

The Necessity of Online Lesson Study

The pursuit of Sustainable Development Goals (SDGs), particularly SDG 4 (Quality Education) and SDG 10 (Reduced Inequalities), emphasizes the critical need for equitable opportunities for effective teacher education. The Global Education Monitoring Report (UNESCO, 2020) has underscored that achieving these goals requires comprehensive and inclusive teacher training strategies that address educational opportunity disparities. Tikly and Barrett (2011) have highlighted that educational systems must ensure that pre-service teachers are equipped not only with pedagogical knowledge but also with the ability to adapt and respond to diverse learning environments. However, despite significant global efforts, educational

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inequality persists, particularly in regions with limited access to resources and training. This underscores the need for innovative models that align with the principles of sustainability and equity, providing all pre-service teachers with the necessary skills and opportunities for professional growth (Aikman & Unterhalter, 2005; Unterhalter, 2017).

Teacher education is vital for fostering the development of high-quality educators capable of navigating complex and evolving classroom environments. Guskey (2002) and Desimone (2009) have emphasized that effective teacher professional development must be ongoing, involve active learning, and include collaborative elements that reinforce practical application. Opfer and Pedder (2011) have argued that teacher learning is an iterative process that requires continuous reflection and adaptation. However, current teacher training programs often face limitations in scope and sustainability, primarily focusing on short-term outcomes (Hargreaves & Fullan, 2012). This presents a significant challenge in structuring teacher education programs to ensure sustained professional growth while addressing the diverse needs of future educators (Knight, 2007; Stoll et al., 2006).

Collaborative lesson study has emerged as a promising approach that integrates reflective practice with professional development, providing pre-service teachers with the opportunity to engage in collaborative planning, observation, and reflection (Lewis, 2002; Stigler & Hiebert, 1999). Dudley (2014) has noted that lesson study encourages a culture of shared inquiry, where teachers collectively analyze lessons, identify strengths and weaknesses, and refine their teaching strategies based on peer feedback. Takahashi and McDougal (2016) have added that this method supports a cycle of continuous improvement, allowing educators to deepen their understanding of instructional techniques and student learning processes. Perry and Lewis (2009) and Fernandez and Yoshida (2004) have emphasized that when implemented effectively, lesson study can bridge the gap between theoretical knowledge and practical application, fostering a deeper connection between pedagogical principles and real-world teaching.

Despite the documented benefits, implementing collaborative lesson study in teacher education faces challenges. Groth (2011) has pointed out that logistical issues such as time constraints and the availability of trained facilitators can hinder the integration of lesson study into university curricula. Additionally, Murata (2011) and Hiebert and Morris (2012) have stressed that while lesson study promotes reflective practice, aligning these activities with broader educational standards and curricula remains challenging. Coenders and Verhoef (2019) have highlighted the need for sustained institutional support to ensure that lesson study can be effectively embedded in teacher training programs. These findings underscore a critical research gap: How can lesson study be adapted and scaled to fit various educational contexts, particularly in higher education, where resources and time are often limited?

Moreover, the importance of reflection within collaborative lesson study cannot be overstated. Schön (1983) first introduced the concept of reflective practice as a means for professionals to analyze and improve their work, a principle that has been foundational in teacher education. Brookfield (1995) has reinforced the idea that reflection should involve both self-assessment and peer feedback to be truly effective. In the context of lesson study, reflective practices enable pre-service teachers to evaluate their teaching methods critically, learn from their peers, and make informed changes to their instructional approaches (Zeichner & Liston, 1996; Hatton & Smith, 1995). Day (1999) and Rodgers (2002) have noted that structured reflection contributes to more profound professional growth, yet practical implementation within teacher training programs remains underexplored. This indicates a need for research into scalable models that integrate structured reflection as an essential component of teacher education (Farrell, 2013; Killion & Todnem, 1991).

The integration of lesson study into university-based teacher education programs is particularly significant. Perry and Lewis (2009) have found that pre-service teachers who participated in lesson studies were better equipped to apply their theoretical knowledge in

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practical settings, enhancing their understanding of instructional design and student learning processes. Fernandez and Yoshida (2004) and Takahashi (2014) have argued that lesson study in university settings supports the development of essential teaching skills, such as lesson planning and anticipating student misunderstandings. However, limited faculty expertise and insufficient time for in-depth lesson study sessions can restrict its effectiveness (Coenders & Verhoef, 2019; Groth, 2011). Rock and Wilson (2005) have noted that while lesson study encourages reflective thinking, universities must overcome logistical and resource-related barriers to maximize its potential impact.

The benefits of lesson study are further amplified when combined with the advantages of online learning platforms. Bozkurt and Sharma (2020) and Hodges et al. (2020) have highlighted how digital technologies became essential during the COVID-19 pandemic, maintaining educational continuity and facilitating collaborative learning. Online platforms offer a way to scale collaborative lesson study, making it accessible to pre-service teachers regardless of location (Means et al., 2009; Murphy, 2020). However, the digital platform presents a significant challenge, with disparities in access to technology impacting the effectiveness of online learning (Tikly & Barrett, 2011; UNESCO, 2020). This calls for developing robust online lesson study platforms designed to be inclusive and adaptive, supporting sustained professional growth and reflective practices across diverse educational contexts.

In response to these challenges and gaps in the literature, the current study seeks to develop and evaluate an online lesson study platform tailored for university-based teacher education programs. By leveraging the strengths of both lesson study and digital learning, this platform seeks to provide pre-service teachers with the tools to engage in reflective, collaborative learning that aligns with SDG 4 and SDG 10, ultimately contributing to a more equitable and effective model of teacher training.

Theoretical Framework of Lesson Study

This study proposes a theoretical model integrating teacher growth, lesson study, and reflective practice. Designed to facilitate continuous professional development, this model elucidates how these elements interact to create a synergistic process that supports teacher growth and addresses the goals of Sustainable Development Goal 4 (SDG 4: Quality Education) and SDG 10 (Reduced Inequalities), as highlighted by UNESCO (2020) and Tikly & Barrett (2011).

Teacher Growth

Teacher growth is conceptualized as the ongoing enhancement of professional abilities and knowledge. This process includes a deepening of subject-specific expertise (Shulman, 1987), the refinement of teaching skills (Hattie, 2009), and the diversification of instructional approaches (Cochran-Smith & Lytle, 1999). Continuous professional growth is essential for educators to respond effectively to students' evolving needs and the educational environment's complexities. Guskey (2002) and Desimone (2009) have emphasized that impactful professional development must be iterative and practical, integrating active learning and collaborative elements that reinforce real-world application. Opfer and Pedder (2011) further argue that teacher growth requires sustained engagement in reflective and adaptive practices, ensuring that professional development remains responsive and contextually relevant.

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Lesson Study

Lesson study provides a collaborative structure through which teachers collectively plan, observe, and reflect on lessons (Lewis, 2002). This approach promotes a culture of cooperation, as Stenhouse (1975) noted, where educators share insights, conduct practical research, and continuously implement feedback to enhance their teaching (Schön, 1983). Initially established in Japan, lesson study has been widely recognized for its efficacy in fostering reflective practice and improving instructional quality, garnering support from researchers such as Perry and Lewis (2009) and Fernandez and Yoshida (2004). Takahashi and McDougal (2016) have highlighted that lesson study supports a cyclical improvement process, enabling educators to deepen their understanding of pedagogical strategies and student learning dynamics. This collaborative reflection contributes to a more refined and adaptable teaching approach, aligning with Dudley's (2014) findings on the value of shared inquiry in professional development.

Reflective Practice

Reflective practice is characterized by three key features that are essential for the professional growth of teachers:

Multiple Perspectives: Reflective practice encourages educators to examine their teaching through various perspectives, incorporating feedback from colleagues, students, and self-reflection (Brookfield, 1995; Zeichner & Liston, 1996). This multi-dimensional approach allows teachers to assess their instructional methods comprehensively, facilitating a balanced and nuanced understanding of teaching effectiveness.

Continuous Improvement: As Day (1999) and Rodgers (2002) have highlighted, reflective practice supports an ongoing refinement process. Reflection should be embedded as a continuous activity, enabling teachers to iteratively adapt their strategies to meet diverse learning needs and optimize educational outcomes.

Concrete Methodologies: Reflective practice is grounded in actionable methodologies that guide teachers in implementing reflective insights directly within their classrooms (Killion & Todnem, 1991). By providing specific tools and strategies, this approach ensures that reflection is not merely theoretical but practical and directly applicable, enhancing the overall impact on teaching practices.

By integrating these dimensions, the theoretical model used in this study aims to promote a reflective environment where teachers systematically analyze and improve upon their instructional methods, fostering a culture of continuous professional growth and collaborative learning.

Theoretical Framework of Teacher Reflection

This study constructs a teacher reflection model grounded in the reflective practice framework proposed by Linda Darling-Hammond (1997, 2006), which is widely acknowledged for its effectiveness in fostering professional growth among educators. Darling-Hammond's framework emphasizes a structured, multi-perspective approach to self-evaluation, encouraging teachers to continuously refine their instructional practices in response to objective and systematic analysis. This reflective model aims to enhance the quality of education by promoting an evidence-based and responsive approach to teaching.

The proposed model aligns with a broader body of research that has underscored the importance of reflection in teacher education. Reflective practice, introduced by Schön (1983), supports a process in which teachers critically examine their actions, question assumptions, and derive insights that contribute to improved educational outcomes. Brookfield (1995) has

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similarly emphasized critical reflection, urging teachers to consider their beliefs and the impact of their practices within a larger educational context. These foundational theories provide a compelling rationale for adopting a structured reflection model that prioritizes continuous self-improvement and professional growth in educational settings (Lewis, 2002; Rodgers, 2002).

The analytical framework in this study aims to incorporate five essential perspectives articulated by Darling-Hammond (2006), each developed to support teachers in systematically evaluating and enhancing their instructional approaches:

Student Learning Processes and Outcomes: This perspective directs teachers' attention to understanding students' cognitive and developmental progress. By observing and analyzing student behaviors, participation, and performance, teachers can identify unique learning needs and adapt their instructional methods to foster optimal learning outcomes. This reflective approach aligns with research by Zeichner and Liston (1996), which has advocated for structured reflection on PST learning as an essential component of teacher education.

Effectiveness of Teaching Methods on Student Impact: This dimension emphasizes evaluating the efficacy of various instructional approaches in promoting student engagement and understanding. Teachers are encouraged to assess the impact of different pedagogical strategies, incorporating innovative techniques such as digital tools and actively seeking feedback from students to refine their practice. Studies by Guskey (2002) and Desimone (2009) have demonstrated that a focus on the effectiveness of instructional methods is central to impactful professional development.

Classroom Environment and Atmosphere: Recognizing that a supportive learning atmosphere is critical to student success, this perspective urges teachers to consider the classroom environment's role in facilitating positive learning interactions. Teachers are prompted to reflect on the physical setup, emotional climate, and quality of student-teacher interactions within the classroom. A conducive classroom environment has been identified as a critical factor in motivating students and enhancing academic achievement (Hargreaves & Fullan, 2012; Stoll et al., 2006).

Personal Educational Philosophy and Its Practice: This perspective guides teachers in aligning their instructional decisions with their educational beliefs, ensuring that personal values resonate through professional practice. By reflecting on how personal philosophy manifests in the classroom, teachers cultivate integrity and authenticity, fostering a more meaningful educational experience for both themselves and their students. Brookfield (1995) and Knight (2007) have emphasized that alignment between beliefs and actions is essential for developing a consistent and impactful teaching approach.

Continuous Growth through Reflective Dialogue: The final perspective stresses the significance of reflective dialogue for ongoing professional development. Engaging in discussions with colleagues, students, and other stakeholders provides teachers with diverse perspectives and constructive feedback, promoting a culture of shared learning and continuous improvement. As Lewis (2002) and Takahashi and McDougal (2016) highlighted, collaborative reflection is essential in lesson study practices and contributes to the enhancement of teaching quality across educational contexts.

Through these five perspectives, the proposed model used in this study facilitates a systematic process by which teachers critically analyze and refine their instructional practices. This multi-dimensional approach to reflection not only supports individual professional growth but also aligns with broader educational goals, such as fostering a culture of reflective practice and continuous improvement within the teaching profession. By drawing on established theories and evidence-based frameworks, this model is positioned to contribute meaningfully to developing reflective, adaptive, and effective educators, thereby enhancing the quality of education in alignment with SDG 4 and SDG 10.

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Online Lesson Study Program

In this study, an online lesson study platform was developed and integrated into a university-based teacher education program to enhance the practical teaching skills of pre-service teachers (PSTs). This platform was specifically designed to allow PSTs to engage in the lesson study process without time and location constraints, thereby facilitating a more flexible and accessible learning environment. Consistent with findings by Bozkurt and Sharma (2020) and Hodges et al. (2020) regarding the effectiveness of digital learning platforms, the online lesson study platform could offer PSTs the opportunity to engage with the latest technologies and methodologies, enriching their educational experiences and fostering innovation in teaching practices.

The structure of this online lesson study program is grounded in the traditional Japanese lesson study model, widely recognized for its effectiveness in teacher professional development (Lewis, 2002; Stigler & Hiebert, 1999). The traditional model typically consists of three key phases: preparation, lesson observation, and post-lesson discussion (Takahashi & McDougal, 2016). In the preparation phase, teachers conduct in-depth research on teaching materials and analyze the characteristics and needs of their students, crafting a detailed lesson plan based on these insights. The lesson observation phase then allows a teacher to deliver the lesson while colleagues observe, focusing on both instructional techniques and student engagement. Finally, in the post-lesson discussion, teachers engage in reflective dialogues, examining the lessons' strengths and areas for improvement. This iterative process has been shown to contribute significantly to continuously enhancing lesson quality, as highlighted by Perry and Lewis (2009) and Dudley (2014). In adapting this structure to an online platform, this study retained the traditional phases while offering pre-service teachers a flexible and accessible format. PSTs were asked to participate in all stages of the lesson study process, including material research, lesson planning, lesson implementation, self-evaluation, and reflective discussion. By engaging in these activities through the online platform, PSTs were assumed to eventually bridge the gap between theory and practice, gaining practical experience in systematically refining lesson quality. This approach aligns with Zeichner and Liston's (1996) call for connecting theoretical learning with practical application in teacher education while also expanding Schön's (1983) model of reflective practice into digital environments.

The implementation of the online lesson study program in this study began with a series of foundational lectures covering essential topics, such as effective teaching methodologies, lesson design principles, and various evaluation techniques. These lectures aimed to equip PSTs with a solid theoretical foundation, ensuring they understood the principles behind effective lesson design and could apply them in practice. This approach follows Guskey's (2002) recommendation for professional development programs to balance theoretical understanding with practical application. Additionally, the lectures were implemented to guide PSTs in understanding essential methods for assessing student comprehension and delivering constructive feedback on critical skills within the lesson study process that contribute to professional growth (Day, 1999; Hattie, 2009).

After completing the instructional phase, PSTs were organized into small teams, typically consisting of three to four members, to develop lesson plans collaboratively. Collaborative reflection is essential in lesson study, and research by Stenhouse (1975) and Knight (2007) has highlighted the importance of peer feedback in fostering professional growth. Thus, this team-based structure in this study allowed PSTs to share ideas, critique each other's lesson plans, and iteratively refine their designs, fostering a culture of mutual learning and professional growth. Even without direct supervision, this peer feedback mechanism could provide a vital avenue for constructive critique, supporting ongoing lesson improvement and reinforcing a collaborative learning environment (Brookfield, 1995).

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In this study, Microsoft Teams and Microsoft Stream were selected as the primary digital tools to support the lesson study process due to their suitability for supporting real-time communication and collaboration among participants in the context of the teacher education program. Microsoft Teams facilitated interactive discussions and document sharing, allowing PSTs to collaborate on lesson planning and reflection from anywhere. Microsoft Stream enabled the recording and sharing of lesson observations, providing PSTs with opportunities to review their teaching practices, engage in self-reflection, and integrate feedback at their convenience. This digital infrastructure aligns with findings by Means et al. (2009) on the potential of technology to support effective collaborative learning and continuous reflection, particularly in remote or resource-limited settings.

Through this online platform, PSTs engaged in a continuous cycle of lesson study, receiving timely feedback and iteratively enhancing their teaching practices. This approach not only improved the quality of their lesson plans but also prepared them to become reflective practitioners capable of contributing to the ongoing advancement of educational practices. By offering a flexible, accessible model that can be implemented across varied educational contexts, this study provides an innovative approach to lesson study that aligns with the goals of Sustainable Development Goal 4 (SDG 4) and addresses the broader need for equitable access to quality teacher development, as emphasized in international educational research (Tikly & Barrett, 2011; UNESCO, 2020).

Research Aim and Objectives

The primary aim of this study was to develop, implement, and evaluate a novel online lesson study platform within a university-based teacher education program, contributing to a flexible and scalable model for teacher professional development. Traditional lesson study has proven effective in fostering reflective practices (Brookfield, 1995; Lewis, 2002); however, this study uniquely adapts lesson study to an online environment, broadening access to professional development for pre-service teachers across varied contexts. By offering opportunities for reflective dialogue and peer feedback in a digital format, this platform addresses challenges associated with geographical barriers and limited resources, aligning with global efforts to enhance educational equity and quality (SDG 4; UNESCO, 2020).

To achieve this aim, the study set three primary objectives:

1) to examine the effectiveness of the online lesson study platform by analyzing the depth and breadth of reflective practices among participating pre-service teachers. Reflective practice is essential to teacher growth, enabling educators to assess and refine instructional methods critically. The online format in this study facilitated continuous reflection and iterative improvement, extending Schön's (1983) concept of reflective practice into digital spaces, an area not fully explored in previous research (Guskey, 2002; Opfer & Pedder, 2011).

2) to evaluate the platform's capability to foster meaningful peer feedback and collaborative learning, central elements in lesson study that have been shown to enhance reflective depth (Dudley, 2014; Takahashi & McDougal, 2016). By investigating how pre-service teachers incorporated peer feedback to refine lesson plans and instructional strategies, this study offers new insights into how digital lesson study can promote reflective practice and professional growth, particularly in contexts where traditional face-to-face collaboration may be challenging.

3) to establish a framework that supports continuous teacher growth by integrating lesson study and reflective practice within a flexible, online format. This framework is based on principles of multi-perspective analysis and iterative self-improvement, as articulated by Darling-Hammond (2006) and Brookfield (1995). Embedding structured reflection and collaborative inquiry online, this framework provides an adaptable professional development

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model that can be applied in diverse international settings to promote continuous improvement and reflective teaching practices (Perry & Lewis, 2009; Hargreaves & Fullan, 2012).

In summary, this study contributes to the existing literature by presenting a unique, scalable approach to lesson study that extends beyond traditional, location-bound methods. The platform addresses critical challenges in teacher education by offering an innovative model that enhances reflective practices and peer collaboration within an accessible digital environment. This approach not only supports the development of reflective, adaptive educators but also aligns with international objectives of improving teacher quality and advancing equitable access to professional development across varied educational contexts.

Research Methodology

General Background

This study employed a mixed-methods research design, integrating both qualitative and quantitative approaches to assess the effectiveness of an online lesson study platform developed within a university-based teacher education program. Conducted over one academic semester, from April to July 2024, this exploratory study aimed to evaluate the program's impact on pre-service teachers' reflective practices and professional growth. The design addressed common challenges in traditional lesson study, such as time and location constraints, by incorporating digital tools that support continuous reflection and collaboration, particularly in settings where in-person interaction may not be feasible.

The theoretical framework combines principles of reflective practice with the lesson study model, emphasizing iterative cycles of planning, observation, and reflection. This approach was chosen to replicate the collaborative nature of lesson study while utilizing online platforms to expand its applicability across diverse educational contexts. By aligning with broader educational goals, such as enhancing teacher quality and promoting equitable access to professional development, this study contributes to more inclusive approaches in teacher education.

This research analyzed how an online lesson study platform can improve teaching quality and foster a culture of continuous learning among pre-service teachers. The following sections outline participant selection, instruments and procedures, and data analysis methods to evaluate program outcomes.

Participants

This study involved 115 PSTs enrolled in the online lesson study program as part of their university coursework in teacher education. The sample size of approximately 100 participants was determined based on established recommendations for the McNemar test, ensuring sufficient statistical power for reliable analysis. Fleiss et al. (2003) and Siegfried and Heumann (2005) have suggested that a sample of this size is generally adequate for detecting significant changes in categorical data, particularly in studies focusing on shifts in behavior or perspectives. This appropriately powered sample size could support robust conclusions, especially when investigating changes in reflective practices and assessing program effectiveness.

Among the participants, one was a graduate PST specializing in education, while the remaining 114 were undergraduate PSTs from the Faculty of Education. This participant group was assumed to represent a typical population in teacher education programs, with more than half planning to become teachers in elementary schools, middle schools, or kindergartens upon graduation. The participant difference in the context was assumed to help this study capture a broad spectrum of perspectives relevant to various educational levels and settings by including this diverse group of PSTs.

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The analysis in this study focused on changes in the participants' submitted reflection reports and shifts in their perspectives to assess the development and depth of their reflective practices. Specifically, 103 PSTs who completed two reflection reports during the program's final stages were included in the analysis. This approach enabled a thorough evaluation of the program's effectiveness and helped identify key characteristics in the PSTs' reflections, ultimately highlighting future challenges for teacher education.

Instrument

The primary instrument in this study was an online lesson study platform, utilizing Microsoft Teams and Stream to facilitate collaborative reflection and remote engagement in the lesson study process. Microsoft Teams was assumed to support real-time communication and lesson planning discussions, while Microsoft Stream was assumed to enable asynchronous lesson review. This digital setup was expected to ensure participants flexible access to each stage of lesson study—preparation, observation, and reflection.

Participants used a structured reflection template designed based on Darling-Hammond's reflective perspectives to standardize and deepen reflective practices. This template was designed to allow for consistency across reflections, supporting both qualitative and quantitative analysis.

IBM SPSS Statistics (ver26) was used for statistical analysis to conduct the McNemar test, assessing changes in PSTs' reflective practices over time.

Ethics

This study adhered to ethical guidelines to protect participants' privacy and confidentiality. All data collected from the participants was anonymized before analysis. In addition, the purpose and methods of the research were clearly explained to all participants, both verbally and in writing, before the start of the program. Informed consent was obtained from all participants, ensuring they understood the voluntary nature of their participation and the steps taken to safeguard their privacy.

Data Analysis Procedure

This study employed a mixed-methods approach, integrating both qualitative and quantitative research methods to assess the impact and effectiveness of the online lesson study program and to explore the characteristics of PSTs' reflective practices.

Qualitative Analysis

The primary qualitative analysis was conducted on the self-reflection reports that PSTs submitted through Microsoft Teams. Each PST was asked to create and submit reflection reports at two period points during the program, and these reports were anonymized before analysis. The focus of the qualitative analysis was to examine the presence or absence of the five reflective perspectives outlined by Darling-Hammond: (1) student learning processes and outcomes, (2) effectiveness of teaching methods, (3) classroom environment and atmosphere, (4) the teacher's personal educational philosophy and its implementation, and (5) the teacher's continuous growth through reflective dialogue. For each of the 103 PSTs, the perspectives were analyzed for their inclusion in the reflection.

To determine whether each of the five perspectives was present, the reports' content was carefully interpreted. Two co-authors independently evaluated each report to enhance reliability, assessing whether each perspective was reflected. The agreement rate between the evaluators

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was 94.6%, indicating a high level of reliability. In cases where discrepancies occurred, the evaluators discussed the points of contention and reached a consensus on the final assessment. This iterative process was essential in ensuring consistency and dependability in the analysis.

Quantitative Analysis

Following the qualitative analysis, the same set of anonymized reflection reports submitted by PSTs via Microsoft Teams was utilized for the quantitative analysis. Recurring themes identified in the qualitative data were quantified, allowing for the identification of common patterns related to the five reflective perspectives outlined by Darling-Hammond. This approach was assumed to enable a comprehensive understanding of the program's impact on PSTs' reflective practices.

To determine whether there was a statistically significant increase in the number of PSTs reflecting on each of the five perspectives between the first and second reflection reports, the McNemar test was applied. This test was selected due to its suitability for analyzing paired categorical data with binary outcomes, where each reflective perspective was coded as either present or absent. The test provided insights into whether the program effectively enhanced the depth and breadth of PSTs' reflective practices over time, offering a rigorous analysis of the program's impact on PST reflection.

Integrated Evaluation

The results of the qualitative and quantitative analyses were integrated to provide an overall assessment of the online lesson study program's effectiveness. This integration offered a detailed understanding of how PSTs engaged with reflective practices and highlighted specific characteristics of their reflections. Based on these findings, key areas for improvement were identified, and strategies for enhancing the program were proposed. These strategies focused on fostering deeper reflection and improving the overall quality of teacher education.

This integrated evaluation clarified the program's effectiveness in promoting teacher growth and reflective practices, offering practical measures to further enhance the development of reflective skills in future teacher education programs.

Research Results

Program Implementation

The online lesson study program with weekly sessions was implemented as scheduled from April to July 2024. The program was incorporated into the faculty of education's curriculum, and the first eight sessions consisted of lectures on educational methods conducted either in person or online. Each session lasted 90 minutes. To foster relationship-building among the PSTs, the first two sessions were held face-to-face in a university classroom, where PSTs attended lectures and worked in small groups to develop lesson plans collaboratively. From the third session onward, PSTs participated in online lectures and engaged in group activities using the breakout feature of Microsoft Teams to practice collaborative lesson planning.

Throughout the study, 13 sessions were conducted weekly at the university. Table 1 summarizes the content and objectives of these 13 sessions. Of the 13 sessions, 7 focused on lectures related to teaching methods, 1 was dedicated to lesson planning, 2 focused on video recording and editing, and the final 2 sessions centered on PST reflections. Each session was designed to build on previous lessons, fostering a deeper understanding of lesson planning, teaching methodologies, and reflective practices accordingly (Table 1).

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Table 1
Overview of the Online Lesson Study Program Sessions, Including Content and Objectives

Session	Content	Objective
1	Lecture on lesson planning; collaboratively creating lesson plans (onsite at a university classroom)	To learn how to create lesson plans; to experience collaborative lesson planning
2	Lecture on teaching methods and lesson planning (onsite at a university classroom)	To master the basic model of a 1-hour lesson; to apply the knowledge to lesson planning
3	Lecture on empirically based teaching methods, and lesson planning	To learn to plan multiple lesson hours; to apply the knowledge to lesson planning
4	Lecture on goal setting in lessons, and lesson planning	To master the methods for setting goals for 1-hour lessons; to apply the knowledge to lesson planning
5	Lecture on learning theories, cognitivism, and lesson planning	To learn teaching methods based on cognitivism; to apply this knowledge to lesson planning
6	Lecture on learning theories, sociocultural theories, and lesson planning	To learn teaching methods based on sociocultural theories; to apply this knowledge to lesson planning
7	Lecture on evaluation methods, and lesson planning	To master evaluation methods during and after a 1-hour lesson; to apply this knowledge to lesson planning
8	Independent lesson planning; peer review	To apply what has been learned to create a 1-hour lesson plan; to refine the plan through peer review
9–10	Video recording and editing	To practice delivering the created lesson plan and record it; to observe self-performance
11	Group viewing of videos; peer review	To watch videos of other PSTs to learn diverse teaching methods; to reflect on own video
12	Lecture on reflective perspectives (Darling-Hammond); group viewing of videos; peer review	To collaboratively reflect and discover the diversity of reflections; to deepen personal reflections on own video
13	Report writing	To deepen personal reflections and write reports on own recorded video

After completing the lectures, PSTs received instructions on the objectives and methods for video recording. They then spent three weeks planning, recording, and editing the content of their lessons, which were later uploaded to Microsoft Stream. The URLs for these videos were shared among all participants to facilitate easy access.

PSTs were assigned to random groups of four, where they watched and reflected on each other's videos in a collaborative setting. For one week, PSTs were asked to comment freely on the videos via Stream. This system allowed PSTs to watch and provide feedback on the videos at their convenience, as long as the URL was accessible. The following week, a lecture was delivered to deepen their reflections further, focusing on theories and methods of teacher reflection.

After this final lecture, PSTs were again grouped randomly into teams of four PSTs to engage in collaborative reflection. They then submitted a second reflection report. These two reflection reports formed the basis for the subsequent analysis.

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General Results

The data analysis revealed that the online lesson study program implemented in this study contributed to both positive developments and highlighted areas for improvement in the PSTs' reflective practices. Key findings from the analysis, supported by quantitative data, are as follows:

PST Engagement with Reflective Practices: Many PSTs engaged actively in reflective practices, particularly in their reflections on lesson planning and classroom management. Initial reflection reports focused on immediate, practical concerns, such as lesson delivery quality and levels of student engagement during lessons.

Deepening of Reflective Depth: The second round of reflection reports showed a marked improvement in the depth of reflection. More PSTs expanded their reflections to address broader teaching aspects, including the impact of their teaching methods on student learning outcomes and connections to their personal educational philosophy. This deepening of reflection suggested that the structured lesson study process facilitated meaningful professional growth among the PSTs.

Areas Requiring Further Development: Despite these improvements, some PSTs continued to face challenges in reflecting on students' cognitive processes, such as identifying potential misconceptions or anticipating areas where students might encounter difficulties. This gap indicates a need for additional support to guide students in considering these critical aspects of teaching more effectively.

Qualitative Analysis Results of Reflective Practices

The primary focus of the outcomes analysis was to evaluate the effectiveness of the online lesson study program in fostering deep and meaningful reflection among PSTs. Reflective practices were crucial for teachers' professional development, as they enabled educators to critically examine their teaching methods, student interactions, and personal educational philosophies.

Results of Reflective Content Analysis

The analysis of PSTs' reflection reports revealed varied engagement with the five reflective perspectives proposed by Darling-Hammond: (1) student learning processes and outcomes, (2) the effectiveness of teaching methods on student impact, (3) the classroom environment and atmosphere, (4) personal educational philosophy and its practice, and (5) continuous growth through reflective dialogue. While PSTs demonstrated strong engagement in reflecting on students' learning processes and teaching effectiveness, there was initially less emphasis on reflecting on their personal educational philosophy and continuous professional growth. This disparity suggested that PSTs focused more on immediate, practical concerns rather than broader, long-term professional development.

Results of Reflective Depth and Breadth

To address the initial imbalance in reflective engagement, targeted instructions on incorporating all five reflective perspectives were provided before the second round of reflections. The results indicated a significant increase in the number of PSTs reflecting on their personal educational philosophy and continuous growth through dialogue. This finding suggested that these perspectives were not absent but latent and that explicit guidance helped PSTs deepen and broaden their reflective practices.

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Results of Feedback Acceptance and Application

The analysis also highlighted the importance of feedback in shaping reflective practices. PSTs who actively engaged with feedback demonstrated notable improvements in their reflections. However, the level of engagement with feedback varied, with some PSTs exhibiting more superficial interactions. This variability underscores the need for further support to help PSTs effectively integrate feedback into their reflective practices.

Results Indicating Changes in Educational Practices

Although direct observation of changes in teaching practices was beyond the scope of this study, the analysis of reflection reports provided insights into how PSTs planned to implement changes based on their reflections. Many PSTs intended to modify their instructional strategies, classroom management techniques and approaches to student engagement. These planned modifications suggested that the program encouraged PSTs to consider practical applications of their reflections. However, implementing these changes and their long-term impact requires further study.

Results Highlighting Development in Reflective Practice

The analysis focused on three PSTs (A, B, and C) whose second reflection reports showed a significant increase in word count compared to their first reports. These PSTs' first reports reflected on at least three of the five perspectives, while their second reports included all five perspectives. The increased word count and more detailed content illustrate both a broader engagement with the reflective perspectives and a qualitative deepening of their reflections.

Table 2 presents examples from these PSTs' reflection reports, showing how their reflections developed between the first and second reports. The first report primarily focused on practical aspects, such as lesson delivery, whereas the second report expanded to include deeper considerations like personal educational philosophy and students' cognitive processes. These examples highlight the improvement in the depth and quality of the PSTs' reflections, illustrating the program's effectiveness in fostering reflective practice.

Table 2
Examples of Reflection Reports from Three PSTs

1: Student Learning Processes and Outcomes	
First Report	Second Report
A: No description	A: I believe it was adequate to design the lesson so that all the students first confirmed the task together. By incorporating this step before moving on to the main learning activity, I thought it would enhance the students' understanding.
B: No description	B: In my lesson video, I could somewhat utilize students' prior learning as a review, but I overlooked individual students. I proceeded with the lesson assuming that all students had already understood previous content, without considering individual learning processes.
C: I used the method of teaching decimal division, but it seemed that the students had some difficulty understanding how to handle the decimal point.	C: I realized the importance of being aware of the students' comprehension level and adjusting the explanation speed to ensure all students can follow along.

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2: Effectiveness of Teaching Methods on Student Impact	
First Report	Second Report
A: I thought it would be beneficial to give students time to confirm their ideas with each other before presenting their thoughts about how to represent the graph.	A: Before presenting their ideas, I would like to give students time to confirm their ideas with each other. Also, I plan to ask more questions or intentionally make a mistake during the lesson to encourage students to think from different perspectives.
B: I did not engage students actively by asking questions or facilitating discussions.	B: I regret leading the lesson without allowing students to confirm their understanding. I should have ensured that students who struggled could still keep up.
C: I want to improve my ability to summarize key points when explaining and make sure that my instructions are clear to the students.	C: I was able to provide time for students to practice solving review problems, and I believe this helped solidify their understanding. I also plan to challenge them with slightly more complex problems to draw out more learning outcomes.
3: Classroom Environment and Atmosphere	
First Report	Second Report
A: My tone of voice tended to drop at the end of sentences. I think I could create a better classroom atmosphere if I spoke more energetically.	A: As a point of improvement, I plan to speak more energetically and smile more often. I also plan to raise my gaze and pay more attention to my tone of voice, especially when emphasizing key points.
B: I was not aware of the classroom atmosphere at all. I should have created a more supportive environment where students can ask each other for help when they do not understand something.	B: I completely overlooked the classroom atmosphere. I will reflect on how to create a more positive learning environment where students can be motivated to engage.
C: It seemed that my lowered gaze and quiet voice made me appear less confident, which may have affected the students' focus.	C: While I believe I generally maintained a supportive atmosphere, I realized I could do more to enhance the students' motivation by providing more positive feedback during the lesson.
4: Personal Educational Philosophy and Its Practice	
First Report	Second Report
A: No description	A: I believe that individualized attention and support are crucial in teaching. I plan to make sure I can observe the whole class and be mindful of students who may struggle to follow along.
B: I did not have a clear educational philosophy or objective in mind during the lesson planning and video recording.	B: I realized I lacked a solid educational philosophy during the lesson preparation. This has been a point of reflection for me.
C: No description	C: In this lesson, I kept my educational philosophy of helping students to be active learners, and I believe I was able to incorporate this into my lesson plan.
5: Continuous Growth through Reflective Dialogue	
First Report	Second Report
A: No description	A: I believe I was able to critically analyze my lesson. For example, I realized that my explanations were too lengthy and difficult for students to grasp.
B: I did not reflect on my lessons from the students' perspective.	B: Through sharing the video with my group, I discovered various ways to improve my teaching. I plan to continue sharing and discussing my lessons with peers and mentors to gain valuable feedback.
C: No description	C: I realized the importance of understanding students' needs first when planning lessons. As a teacher, I need to keep learning and adjusting my teaching strategies based on students' feedback and observations.

Quantitative Analysis of Reflective Practices

A comparative analysis of the first and second reflection reports was quantitatively conducted to assess the program's effectiveness. The data were analyzed using the McNemar test to evaluate the presence or absence of descriptions across each of the five reflective perspectives. The results are summarized in Table 3.

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Table 3
Results of McNemar Test for Reflective Perspectives Between First and Second Reports

Perspective	Report Respondents		McNemar Test Statistic (χ^2)
	First (n, %)	Second (n, %)	
1: Student Learning Processes and Outcomes	34 (33)	52 (50)	8.1*
2: Effectiveness of Teaching Methods on Student Impact	70 (68)	94 (91)	22.15***
3: Classroom Environment and Atmosphere	99 (96)	100 (97)	0.2 (ns)
4: Personal Educational Philosophy and Its Practice	8 (8)	85 (83)	75.05***
5: Continuous Growth through Reflective Dialogue	19 (18)	83 (81)	64***

Note. $N = 103$
*$p < .01$, ***$p < .001$, ns = not significant.

The results showed statistically significant improvements for the "student learning processes and outcomes" perspective at the 1% level, and at the 0.01% level for the "effectiveness of teaching methods on student impact," "personal educational philosophy and its practice," and "continuous growth through reflective dialogue" perspectives. These findings suggest that targeted educational interventions can effectively enhance PSTs' reflective practices.

Results on Reflective Depth and Breadth

To address initial imbalances in reflective engagement, PSTs received targeted guidance on incorporating all five reflective perspectives before the second round of reflections. As shown in Table 3, the number of PSTs reflecting on their personal educational philosophy and continuous growth through dialogue significantly increased in the second report. This outcome suggested that reflective dimensions were not absent initially but rather latent; the additional guidance helped bring these reflections to the forefront, contributing to a notable improvement in both the depth and breadth of PSTs' reflective practices.

Results on Feedback Acceptance and Application

The analysis also underscored the critical role of feedback in enhancing PSTs' reflective practices. PTSs who actively engaged with the feedback they received demonstrated substantial improvements, particularly in reflections related to teaching methods and student learning impact. However, the extent of feedback engagement varied among PSTs, with some exhibiting only superficial interaction. This variability suggested a need for further support to help PSTs effectively integrate feedback into their reflective processes.

Reported Changes in Educational Practices

Although direct observation of changes in actual teaching practices was beyond the scope of this study's scope, the analysis of reflection reports provided insights into PSTs' intended to apply their reflections to future teaching contexts. Many PSTs reported plans to adjust instructional strategies, classroom management techniques, and approaches to student engagement based on their reflections. These intentions indicate that the program encouraged critical reflection on teaching practices and practical planning for improvement. However, evaluating the long-term impact of these planned changes on teaching practices requires further study.

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Reflective Practices on Students' Cognitive Processes

The outcomes analysis revealed that while the online lesson study program was effective in fostering reflective practices, a notable challenge remained in pre-service teachers' ability to reflect on students' cognitive processes. This difficulty was anticipated, as participants did not have the opportunity to teach actual students during the program, limiting their reflections to hypothetical assumptions about how students might respond to their lessons. Additionally, many pre-service teachers had limited or no prior experience with elementary school students, resulting in a restricted understanding of students' developmental characteristics in thinking and emotions.

Given these limitations, it became evident that relying solely on reflective prompts was insufficient to encourage comprehensive reflections on students' cognitive processes. An in-depth analysis of the second reflection reports from the 52 pre-service teachers who specifically addressed Student Learning Processes and Outcomes revealed several strategic focal points that could enhance reflections on students' cognitive processes. The following sections present these focal points, along with examples from pre-service teachers' reflection reports.

Focusing on Students' Learning Goals

Strategy: Encourage pre-service teachers to identify and reflect on students' specific learning goals. By centering their teaching strategies on these goals, they can align their instructional practices to support students' objectives. PST Response Example: "Through reflection, I realized that the students were focused on understanding how to measure angles, but my lesson did not fully address this. I plan to revise my approach to ensure that their goal is the central focus of the lesson."

Addressing Misconceptions

Strategy: Develop sessions where pre-service teachers can explore and reflect on common misconceptions students may have in different subjects. This approach allows them to design lessons that directly address and clarify these misunderstandings. PST Response Example: "I noticed that many students believed that heavier objects fall faster, which is a common misconception. In my next lesson, I will incorporate experiments that clearly demonstrate the concept of gravity to correct this misunderstanding."

Assessing Students' Comprehension

Strategy: Encourage pre-service teachers to regularly assess and reflect on how well students understand the material. This reflection allows them to identify areas of confusion and adjust instructional strategies to meet students' needs more effectively. PST Response Example: "During group work, I realized that several students were confused about the difference between area and perimeter. I will revisit this topic in the next lesson, using more visual aids to reinforce understanding."

Adapting to Students' Learning Pace

Strategy: Guide pre-service teachers to consider whether the pace of their instruction aligns with students' learning pace. Adjusting the instructional speed based on students' needs helps ensure that all students can keep up and fully understand the material. PST Response Example: "Some students struggled with the pace of the lesson on fractions. In future lessons, I will slow down the introduction of new concepts and provide additional practice opportunities to ensure everyone keeps up."

Identifying Potential Stumbling Blocks

Strategy: Encourage pre-service teachers to reflect on potential stumbling blocks students might encounter during learning. Anticipating these challenges allows them to prepare strategies to help students overcome obstacles and improve their learning experience. PST Response Example: "I observed that many students struggled with word problems in math

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due to the complexity of the language used. I plan to break down the problems into simpler steps and use more straightforward language in future lessons to reduce these barriers."

Discussion

The results of this study have shown that an online lesson study platform can foster pre-service teachers' reflective practices, especially in teaching effectiveness and student learning outcomes. However, challenges persisted in areas such as reflecting on children's cognitive processes. Only 50% of participants in the second round reflected on student learning processes and outcomes, compared to 33% in the first round (see Table 3). These findings align with Groth's (2011) observations that limited classroom experience can hinder deeper reflections among pre-service teachers. Based on the study's findings and existing literature, the following strategies are proposed to enhance the program.

Reflecting on Children's Cognitive Processes

While there was a marked improvement in PSTs' reflections on student learning processes by the second round (from 33% to 50%), a need for deeper reflections on cognitive processes remained. Zeichner and Liston (1996) have emphasized the importance of guided instruction for teachers to anticipate and address student misconceptions. Integrating targeted sessions focused on common cognitive challenges could facilitate more profound reflections, demonstrating the adaptability of Darling-Hammond's reflective framework in digital environments.

Enhancing Peer Feedback Mechanisms

This study shows that peer feedback positively impacted reflection, with a notable increase in teaching effectiveness reflections, rising from 68% in the first round to 91% in the second. However, the depth of engagement with feedback varied among PSTs. Structured feedback mechanisms, including reflection prompts, could standardize reflective depth and ensure alignment with Takahashi and McDougal's (2016) emphasis on structured inquiry in collaborative learning. The integration of structured peer feedback illustrates how online platforms can cultivate multi-dimensional reflections—a crucial element for sustained teacher growth.

Embedding Personal Educational Philosophy in Reflection

Initially, only 8% of participants reflected on their educational philosophy, but this increased to 83% after guided prompts were introduced (see Table 3). Brookfield (1995) has suggested that personal philosophy is often overlooked in favor of practical aspects; thus, targeted prompts that connect educational beliefs with teaching practices could reinforce a holistic approach to reflection.

Sustained Reflective Practice Support

The findings indicate that continuous prompts and feedback support deeper reflections, with "continuous growth through reflective dialogue" improving from 18% in the first report to 81% in the second. This significant improvement suggests that reflective practices can be effectively sustained in an online environment. Opfer and Pedder (2011) have highlighted the importance of iterative reflection in professional development, which the online format in this study has successfully supported.

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Conclusions and Implications

This study demonstrates the potential of an online lesson study platform to support reflective practices among pre-service teachers, enhancing their engagement with teaching methods and student outcomes. With substantial increases in reflection rates across multiple dimensions (e.g., teaching effectiveness from 68% to 91%, student learning processes from 33% to 50%), the platform's structured approach proves effective even in the absence of face-to-face interaction. These findings support Schön's (1983) model of reflective practice and Lewis's (2002) insights on lesson study, indicating that traditional models of reflection and lesson study can be adapted effectively to broader, digital contexts.

Theoretical and Academic Contributions

This research contributes to the academic understanding of reflective practices in online environments. The data have shown that Darling-Hammond's reflective perspectives, traditionally applied in face-to-face settings, can be implemented effectively online, as evidenced by the improvements in reflective engagement across rounds. By demonstrating the effectiveness of structured prompts and feedback in fostering comprehensive reflection, this study offers new insights into the adaptability of reflective practice theories in digital education–a critical consideration as online education continues to expand globally.

The findings also underscore the potential for a sustainable model of teacher growth. With reflection rates on personal educational philosophy and continuous growth improving significantly after targeted prompts, this model aligns with the Sustainable Development Goals (SDG 4 and SDG 10) by illustrating how equitable access to quality teacher training can be facilitated online.

Implications for Future Research and Global Education

This research provides a framework for integrating peer feedback and multi-perspective reflection within an online platform. As seen in this study, peer feedback significantly deepened reflections on teaching effectiveness and classroom environment. By examining these findings, this study advances the theoretical understanding of collaborative reflection as a core component of teacher development. Further research could build upon this framework by investigating long-term impacts on reflective practices and exploring simulated teaching environments to enhance PSTs' ability to reflect on cognitive processes, thereby supporting ongoing, contextually relevant teacher education across diverse educational settings.

Declaration of Interest

The authors declare no competing interest.

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FEMALE PRESERVICE TEACHERS' ACHIEVEMENT GOALS AND PERFORMANCE ANXIETIES DURING IMPLEMENTING STEM EDUCATION PROJECTS FOR PRESCHOOL CHILDREN

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Abstract

Female preschool educators usually perceive themselves as less proficient in STEM, leading to heightened performance anxiety (PA), which in turn affects their achievement goals (AG). So, this study aims to examine the impact of PA on AG among female preservice preschool educators implementing STEM education projects. This research hypothesized that PA has both immediate and sustained effects on AG over multiple periods. Additionally, we posited that initial levels of PA and AG are interrelated and influence changes in each other over time. To test these hypotheses, data is collected from sixty female preservice preschool educators participating in a STEM education community for preschool children. Participants completed the Assessment Scale of STEM Education Learning Motivation for Preschool Teachers and the Assessment Scale of STEM Activity Performance for Preschool Teachers. The result of the path analysis model revealed satisfactory indices of goodness-of-fit, but the effects of PA on AG varied across different periods. The latent growth curve models also demonstrated a good fit, showing significant negative covariances between the intercepts and slopes of PA and AG. Specifically, PA exhibited a higher intercept but a lower slope compared to AG. The correlations between the intercepts and slopes of PA and AG were significant, though no significant connections were found between the intercepts and slopes of the two constructs. These findings suggest that while PA initially has a strong influence on AG, its impact diminishes over time, highlighting the complex and evolving relationship between PA and AG in preservice preschool educators engaged in STEM education projects.
Keywords: *achievement goal, female preservice teacher, latent growth curve model, performance anxiety, preschool children, STEM*

Introduction

Early exposure to STEM concepts can serve as a powerful catalyst for igniting children's natural curiosity, laying the groundwork for critical thinking and lifelong learning skills (Brenneman et al., 2019). In early childhood education, teachers play a pivotal role in shaping students' first encounters with STEM topics. As such, the efficacy of these early STEM educational initiatives depends significantly on the competence, confidence, and preparedness of educators (McClure et al., 2017). However, a notable challenge persists in the form of STEM-related anxiety among early childhood educators, especially among female preservice teachers. These educators frequently report low confidence in their ability to teach STEM

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subjects effectively, which may stem from limited experience or negative academic perceptions of STEM disciplines (Sullivan & Bers, 2015).

For female preservice teachers, STEM-related anxiety is often compounded by performance anxiety. Research indicates that female educators in training frequently experience heightened levels of performance anxiety compared to their male counterparts, which can lead to avoidance behaviors, undermining their achievement goals and potentially impacting their professional development (Legette & McCord, 2014; Putwain & Daly, 2014). Academic anxiety, as Freedman (2003) explains, is a negative emotional response triggered by past learning experiences perceived as challenging or discouraging, which may adversely affect future learning. Anxiety that originates from a fear of poor performance in STEM subjects can lead preservice teachers to avoid STEM-focused situations, creating a self-fulfilling cycle of avoidance and underperformance (Furner & Duffy, 2002).

This relationship between anxiety and performance in STEM is nuanced and often context-specific. Mueller (1992) found that individuals with higher performance anxiety struggle more with learning tasks, requiring more time and attempts to achieve proficiency compared to those with lower anxiety levels. Additionally, Eyring et al. (1993) discovered that task-specific anxiety, particularly in STEM, can slow the rate of learning, reinforcing feelings of inadequacy and creating barriers to effective teaching (Mitchell et al., 1994). Anxiety can thus inhibit preservice teachers' capacity to fully engage with STEM content, negatively affecting their professional growth and impacting the quality of STEM education they provide to young learners.

The interactions between anxiety and achievement goals are complex and appear to evolve over time. Aiken (1970) argued that there is a reciprocal relationship between emotional responses and academic achievement, while Ma and Xu (2003) proposed that there is a causal ordering between performance anxiety and achievement goals. In the case of female preservice teachers, high levels of performance anxiety could inhibit their willingness to take on STEM-related challenges, hindering their ability to develop a positive, growth-oriented relationship with these subjects. Although studies have explored the broader relationship between anxiety and academic success, less is known about how these dynamics specifically impact female preservice teachers in early childhood STEM education contexts.

This study seeks to address this gap by examining how performance anxiety and achievement goals interact over time in female preservice teachers, employing Latent Growth Curve Modeling (LGCM) to analyze these changes. By identifying critical points of intervention, this research aims to offer strategies for reducing anxiety and improving achievement orientation, ultimately supporting female preservice teachers as they develop competence and confidence in STEM teaching.

Research Focus

The focus of this research is to examine the trajectories of preservice preschool teachers' achievement goals and performance anxiety and their correlation across times.

Research Aim

To achieve the aim of understanding the overtime impacts of performance anxieties on preservice teachers' achievement goals during STEM education project, this study has had two main objectives:

1. To explore whether preservice teachers' achievement goals are affected by performance anxieties across time.
2. To examine the longitudinal associations of preservice teachers' performance anxieties and achievement goals.

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Research Questions

This study addresses two main research questions:

1. Do preservice teachers' achievement goals vary in response to performance anxiety over time? Additionally, what is the magnitude of both immediate and sustained effects of performance anxiety on these goals?
2. Are there longitudinal associations between preservice teachers' performance anxiety and their achievement goals? Specifically, what are the baseline associations, and how do these associations change over time?

Research Methodology

General Background

This study employed a secondary analysis method to explore the trajectories of female preservice preschool teachers' psychological states, specifically performance anxiety and achievement goals, during the implementation of STEM education projects. Secondary data analysis enables the re-examination of existing data sets to uncover new insights, particularly useful in longitudinal studies such as this one. In this research, several statistical models, including path analysis and latent growth curve models were employed to trace the development of PA and AG over time. These models were chosen because of their capacity to capture both immediate and sustained effects of psychological factors on teacher performance in STEM settings.

LGCM, in particular, allows for the examination of individual change over multiple time points and the identification of factors contributing to these changes. This method is well-suited for understanding complex, dynamic relationships, such as those between PA and AG, providing a detailed picture of how these constructs evolve and interact over the course of a teacher's training. In addition, the use of path analysis models with explicit variables provides insights into both the direct and indirect effects of PA on AG across different periods. The first time point is in the beginning of the Fall 2023 semester, the second time point is in the middle of the same semester, and the third time point is in the end of the same semester.

Sample

A pre-testing phase was conducted to ensure the instruments' readability and logical organization. The pre-test involved 20 undergraduate students with characteristics similar to the final study sample, allowing for necessary adjustments to the questionnaire items for clarity and relevance.

Purposeful sampling was used to select participants, focusing on college students majoring in early childhood education and child development who were actively engaged in STEM education projects and enrolled in teacher training programs centered on STEM. These 60 female preservice preschool educators, part of a STEM education community for preschool children in Taichung City, Taiwan, received comprehensive training that included designing STEM activities, creating STEM kits, and implementing these activities in preschool settings.

Data on participants' performance, motivation, performance anxiety, and achievement goals were collected at three distinct time points to capture developmental changes during their training. The longitudinal dataset enables an in-depth examination of how PA and AG evolve and interact over time in response to STEM training and classroom experiences.

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Instrument and Procedures

Data were collected using two main instruments: the "Assessment Scale of STEM Education Learning Motivation for Preschool Teachers" (Sung, 2024) and the "Assessment Scale of STEM Activity Performance for Preschool Teachers." (Sung, 2024) Each instrument was adapted to the context of the study and aimed to measure the participants' AG and PA, respectively.

Achievement Goal Subscale: The "Assessment Scale of STEM Education Learning Motivation for Preschool Teachers" (Sung, 2024) included the AG subscale, designed to assess participants' motivation toward engaging with STEM activities. Responses were rated on a 5-point Likert scale ranging from "Always" to "Never" and "Very Often" to "Rarely." This scaling allowed for the quantification of attitudes and motivational orientations in relation to STEM activities. Sample items in the AG subscale included statements such as:

- "STEM activities have increased my willingness to face challenges."
- "Challenging STEM activities motivate me to learn."
- "I love linking concepts in STEM activities."

These items were intended to capture various aspects of AG, such as intrinsic motivation, interest, and perceived competence in STEM.

Performance Anxiety Subscale: PA was measured using the "Assessment Scale of STEM Activity Performance for Preschool Teachers," (Sung, 2024) with items reflecting the participants' anxiety levels related to their STEM-related tasks and responsibilities. This subscale also used a 5-point Likert scale anchored with "Not much," "Little," "Somewhat," "Much," and "A great deal." Sample items included:

- "When I do my homework, I feel nervous and under pressure."
- "I become very nervous before a presentation, even if I am well prepared."
- "I worry that I will receive a poor grade in writing papers."

These items were designed to identify specific sources of anxiety, including evaluation apprehension, performance concerns, and general nervousness associated with STEM activities.

Validation of Instruments

A confirmatory factor analysis (CFA) with a bootstrapped method was conducted to ensure the construct validity of both subscales. The CFA results indicated a satisfactory construct validity for the PA subscale ($\chi^2 = 1.019$, $df = 2$, $p = .601$) and the AG subscale ($\chi^2 = 5.131$, $df = 2$, $p = .077$), with all factor loadings exceeding the recommended threshold of 0.7. The composite reliabilities were calculated at .884 for the PA subscale and .843 for the AG subscale, indicating high internal consistency. Additionally, the average variance extracted (AVE) values were .656 for PA and .574 for AG, meeting the criteria proposed by Fornell and Larcker (1981) and Hair et al. (2019) for satisfactory convergent validity. These validation procedures ensured that the instruments reliably measured the intended constructs.

Data Analysis

The analysis employed a three-wave dataset to examine the trajectories of PA and AG among the preservice preschool teachers. The study focused on three primary statistical models to investigate the temporal changes and relationships between these variables:

1. Path Analysis Model:

The path analysis model was used to explore both the immediate and sustained effects of PA on AG across the three time points. This model explicitly incorporated all observed variables

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and covariates, allowing for the identification of direct and indirect pathways through which PA might influence AG. The path analysis provided an initial understanding of the structural relationships between PA and AG, including how these variables potentially interact over time.

2. Unconditional Latent Growth Curve Model

To capture the dynamic nature of PA and AG over time, an unconditional LGCM was fitted. In this model, PA and AG were treated as time-invariant variables measured at three different time points. Two factors were estimated: (1) Growth Intercept Factor: Representing the initial level of each variable. (2) Growth Slope Factor: Representing the rate of change over time.

This model allowed the examination of individual differences in the starting points (intercepts) and growth trajectories (slopes) of PA and AG, providing insights into how these constructs develop throughout the teacher training process.

3. Conditional Latent Growth Curve Model

Building on the unconditional model, the conditional LGCM examined the relationships between the growth factors of PA and AG. This model investigated whether changes in one construct (e.g., PA) were associated with changes in the other (e.g., AG) over time. By including the correlations between the intercepts and slopes of PA and AG, this model provided a more nuanced understanding of their interdependence. The nested structure of the conditional LGCMs allowed for comparison between different configurations of the model, facilitating the identification of the most suitable model to represent the data.

Model Testing and Estimation

All three models were subjected to testing for their goodness-of-fit using indices such as chi-square (χ^2), degrees of freedom (*df*), root mean square residual (RMR), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), and comparative fit index (CFI), following guidelines from Hair et al. (2019) and Hu and Bentler (1998). The maximum likelihood estimation (MLE) method was employed in a two-step process:

Measurement Model Analysis: This step assessed the relationships between each construct (PA and AG) and its measures to confirm the validity of the constructs.

Structural Model Analysis: This step examined the relationships between PA and AG, checking the hypotheses related to their longitudinal associations and dynamic changes over time (Jöreskog, 1993). Model equivalence and fit comparisons were made to select the best-fitting model.

This robust methodological approach ensured a comprehensive analysis of the trajectories of PA and AG among female preservice teachers in a STEM context, addressing both their immediate effects and long-term interrelationships. The insights gained from this analysis can inform strategies for reducing anxiety and fostering positive achievement goals during teacher training programs.

Research Results

Path Analysis Model

Path analysis models were employed to address the first research question, which aimed to capture the complex dynamics between PA and AG, including how PA at an earlier time point affects AG both immediately and in subsequent periods. The hypothesized model is presented in Figure 1, and the default setting posits that PA exerts both immediate and sustained effects on AG, while AG itself demonstrates temporal effects across successive time points.

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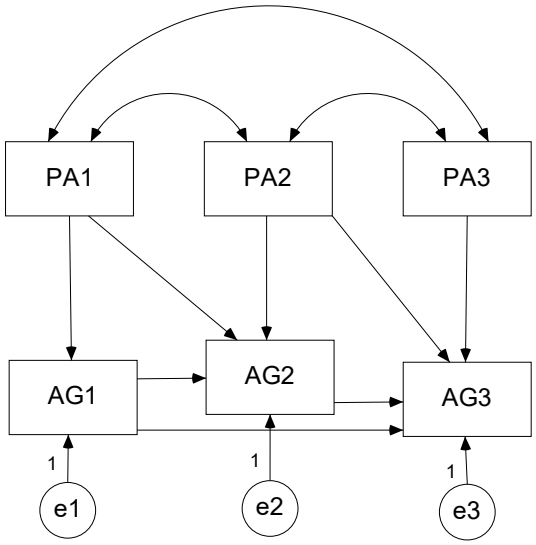
Figure 1
Default Setting of Path Analysis Model



The default path analysis model was structured around four main sets of effects:

(1) Immediate Effects of PA on AG: This pathway examines how PA at each specific time point (PA1, PA2, PA3) directly impacts AG at the same time point (e.g., PA1 → AG1, PA2 → AG2, PA3 → AG3).
(2) Sustained Effects of PA on AG: This pathway investigates the delayed impact of PA on AG at later time points (e.g., PA1 → AG2, PA2 → AG3).
(3) Temporal Effects of AG: This component examines the continuity of AG over time, analyzing how AG at one time point affects AG at the subsequent time point (e.g., AG1 → AG2, AG2 → AG3).
(4) Covariance Among PA Measurements: The model also includes covariances among PA measurements across time points (e.g., PA1 ↔ PA2, PA1 ↔ PA3, PA2 ↔ PA3) to account for the potential interrelationships between different time points of PA.

1. Nested Models for Path Analysis

To identify the most suitable model for explaining the data, we created and tested a series of nested models (Model 1a to Model 1e), each progressively introducing more complexity. The specific settings of these nested models are outlined below:

(1) Model 1a (Basic Model): This model serves as the baseline, where only the variances of the exogenous variables are freely estimated. All regression weights and covariances were fixed to zero.
(2) Model 1b: This model extends Model 1a by allowing all covariances to be freely estimated while keeping the other parameters fixed.
(3) Model 1c: Building upon Model 1b, this model allows the parameters for temporal effects (e.g., AG1 → AG2, AG2 → AG3) to be freely estimated.
(4) Model 1d: In addition to the temporal effects, Model 1d permits the parameters for the sustained effects of PA (e.g., PA1 → AG2, PA2 → AG3) to be freely estimated.
(5) Model 1e (Full Model): This model further includes the immediate effects of PA on

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AG, allowing all relevant parameters to be freely estimated. It represents the most comprehensive model for examining both immediate and sustained effects, as well as temporal effects of AG.

2. Model Comparison and Fit Indices

The model fit indices for each of the nested models are provided in Table 1. Although the chi-square tests of model fitness were rejected for all models, Model 1e demonstrated the best fit among the nested models, as indicated by the chi-square value, Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), Consistent Akaike Information Criterion (CAIC), and Expected Cross-Validation Index (ECVI) values. Specifically, Model 1e had the lowest values across these fit indices, supporting its selection as the best-fitting model for the dataset. The differences in the fitness indices between Model 1e and the other nested models were statistically significant, further validating the robustness of Model 1e.

Table 1
Comparison of Nested Model 1

Model	$\chi 2$	*df*	*p*	AIC	BCC	EVIC
Model 1a	684.6	15	<.001	696.4	696.9	2.33
Model 1b	393.2	12	<.001	411.2	411.7	1.38
Model 1c	243.0	9	<.001	267.0	267.5	0.89
Model 1d	176.6	7	<.001	204.6	205.2	0.68
Model 1e	30.3	4	<.001	64.3	65.1	0.22

3. Model 1e: Best-Fitting Model

For Model 1e, the absolute fit indices revealed a chi-square value of 30.27 ($df = 4$, $p < .001$) and a χ^2/df ratio of 7.57. Although the chi-square and χ^2/df values were not ideal, other fit indices suggested an acceptable model fit. The GFI was .968, indicating that the model accounted for a significant proportion of the observed variances and covariances. The RMR was .043, which is less than .05, suggesting that the discrepancy between the predicted and observed matrices was minimal. Furthermore, the RMSEA was .148, indicating a moderate fit.

The relative indices of model fit were also assessed, with NFI = .956, RFI = .834, IFI = .961, TLI = .853, and CFI = .961. These indices were generally within acceptable ranges, indicating that Model 1e offered a substantial improvement from the null model toward the theoretical perfect model. Collectively, these fit indices supported Model 1e as the most robust model for exploring the relationship between PA and AG.

4. Estimated Coefficients of Model 1e

The estimated coefficients of Model 1e, displayed in Figure 2, reveal several key findings:

(1) Immediate Effects: The immediate effect of PA on AG varied across time points. At time-point 1, the coefficient was negative and significant (PA1 → AG1 = -0.33, $p < .001$), suggesting that higher PA at the initial stage significantly lowered AG. However, at time-point 2, the effect was non-significant (PA2 → AG2 = -0.01, $p = .850$), indicating a temporary decline in PA's influence on AG. By time-point 3, the

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effect regained significance (PA3 → AG3 = -0.47, $p < .001$), suggesting a resurgence of PA's negative impact on AG as the training progressed.

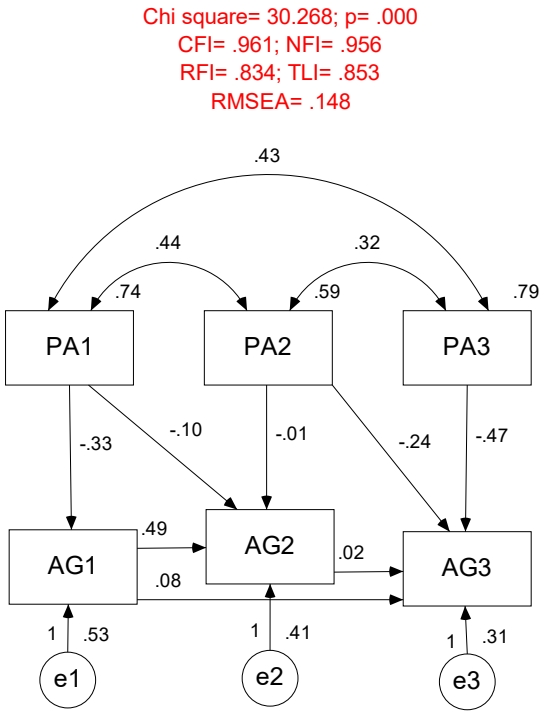
(2) Sustained Effects: The sustained effect of PA on future AG showed mixed results. The effect of PA1 on AG2 was weak and marginally non-significant (PA1 → AG2 = -0.10, $p = .088$). Conversely, the effect of PA2 on AG3 was stronger and statistically significant (PA2 → AG3 = -0.241, $p < .001$). These results suggest that sustained anxiety has a more pronounced impact on AG later in the program.

(3) Temporal Effects of AG: The temporal effect of AG was strong at the initial stages, with AG1 significantly predicting AG2 (AG1 → AG2 = 0.49, $p < .001$). However, this effect weakened substantially over time, becoming non-significant by the next interval (AG2 → AG3 = 0.02, $p = .751$). The effect of AG1 on AG3 was marginal (AG1 → AG3 = 0.08, $p = .096$), indicating a diminishing influence of early AG on later achievement.

5. Interpretation of Results

The analysis of Model 1e indicates that PA has a complex, fluctuating impact on AG throughout the training period. The significant negative effects at time-points 1 and 3 highlight the critical influence of initial anxiety and the resurgence of anxiety toward the end of the training. The weakening of effects at the intermediate stage might be attributed to factors like procrastination or temporary adaptation to the program's demands. The findings underscore the importance of addressing PA continuously and systematically to support the development of AG in preservice teachers.

Figure 2
Estimated Coefficients of Parameters of Path Analysis Model 1e



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Longitudinal Associations among the Baselines and Changes in Preservice Teachers' Performance Anxiety and Achievement Goals

The initial path analysis model was only partially adequate in fitting the dataset, suggesting that a regression model limited to explicit variables might not fully capture the impact trajectory of performance anxiety on achievement goals for preservice preschool teachers. To gain a more comprehensive understanding, we employed a latent variable approach, allowing us to explore the repeated measures of performance anxiety and achievement goals through their underlying latent factors.

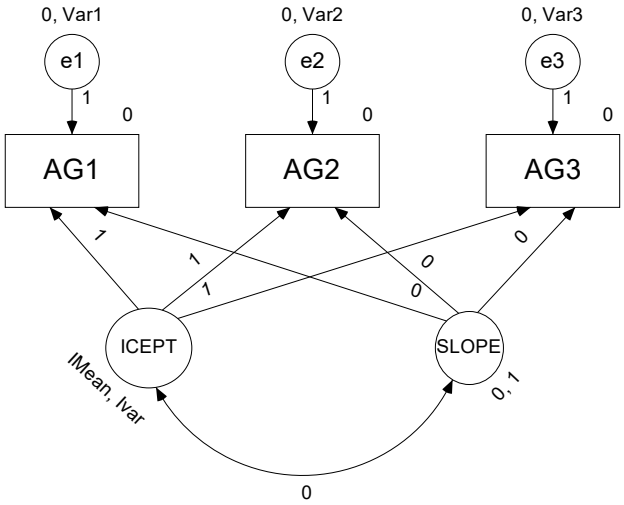
The Latent Growth Curve Model is particularly advantageous in the present study as it systematically explains how performance anxiety and achievement goals evolve over three waves of data collection (Willett & Sayer, 1994). LGCM is suitable for modeling longitudinal data, especially when within-subject variations are dependent and between-subject variations may change over time (Wang, 2009). This methodological approach helps uncover the inherent growth patterns in both performance anxiety and achievement goals.

1. Unconditional Latent Growth Model (Default Setting)

The default setting of the unconditional latent growth model, illustrated in Figure 3, includes two variations: one with only a latent intercept factor and another incorporating both latent intercept and slope factors.

In the model with only an intercept factor, achievement goals at three different time points (AG1, AG2, and AG3) are measured. The factor loadings for the intercept factor are fixed at 1, indicating that this factor uniformly influences all repeated measures. Here, the latent intercept factor captures the initial level of the outcome, while the slope growth factor and the covariance between the intercept and slope factors are set to zero.

Figure 3
Default Setting of Latent Growth Curve Model



In contrast, the model that incorporates both intercept and slope factors retains the fixed intercept loadings but introduces a slope factor that also points to AG1, AG2, and AG3. The factor loadings of the slope factor are scaled according to the timing of the outcome measures, coded as 0, 0.4, and 1 for the achievement goal model. This setup allows the slope factor to

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represent the trajectory of change over time. For the performance anxiety model, the factor loadings of the slope are coded as 0, 0.75, and 1, indicating a different pattern of change over the three measurement points.

2. Model Comparison and Results

The results of the LGCM for achievement goals indicate that the model with both intercept and slope factors outperforms the intercept-only model. The goodness-of-fit indices for the model with intercept and slope factors are $\chi^2 = 0.06$ ($df = 1$, $p = .806$), AIC = 16.1, and BCC = 16.3. In contrast, the intercept-only model yields $\chi^2 = 294.6$ ($df = 4$, $p < .001$), AIC = 304.6, and BCC = 304.7. The significant difference in the fit between these two models ($\Delta\chi^2 = 294.5$, $\Delta df = 3$, $p < .001$) demonstrates that including a slope factor is crucial for accurately modeling changes in achievement goals. The estimated means of the intercept (2.7, $t = 62.4$, $p < .001$) and slope (1.0, $t = 19.8$, $p < .001$) suggest that both the initial level and the rate of change in achievement goals are significantly greater than zero.

Similarly, the LGCM for performance anxiety reveals that the model incorporating intercept and slope factors is superior. For this model, the indices are $\chi^2 = 19.8$ ($df = 1$, $p \leq .001$), AIC = 16.1, and BCC = 16.3, whereas the intercept-only model produces $\chi^2 = 61.7$ ($df = 4$, $p < .001$), AIC = 35.8, and BCC = 36.0. The difference in fit ($\Delta\chi^2 = 294.5$, $\Delta df = 3$, $p < .001$) reinforces the importance of modeling the change trajectory. The estimated means for the intercept and slope are 3.4 ($t = 69.4$, $p < .001$) and 0.2 ($t = 5.9$, $p < .001$), respectively, indicating that the initial level and the rate of change in performance anxiety are also significantly positive.

Given the significance of both the initial levels and rates of change for performance anxiety and achievement goals, it becomes essential to explore their trajectory further. To investigate the relationship between the trajectories of performance anxiety and achievement goals, we constructed a series of conditional latent growth curve models. These models integrate both intercept and slope factors to examine the correlations between the trajectories, as shown in Figure 4. Various competing models (Model 2a, Model 2b, Model 2c, etc.) were compared using different parameter constraints.

3. Setting and Comparison of Competing Models

The settings for the competing models (Model 2) are as follows:

(1) Model 2a: All covariances among achievement goal (AG) and performance anxiety (PA) factors are fixed to 0.
(2) Model 2b: AG factors' covariances with the PA intercept factor are fixed to 0, with other covariances freely estimated.
(3) Model 2c: AG factors' covariances with the PA slope factor are fixed to 0, with other covariances freely estimated.
(4) Model 2d: Covariances between the intercepts (Intercept_AG < > Intercept_PA) and slopes (Slope_AG < > Slope_PA) are fixed to 0.
(5) Model 2e: Covariances between Intercept_PA < > Slope_AG and Slope_PA < > Intercept_AG are fixed to 0.
(6) Model 2f: All covariances between AG factors and PA factors are freely estimated.

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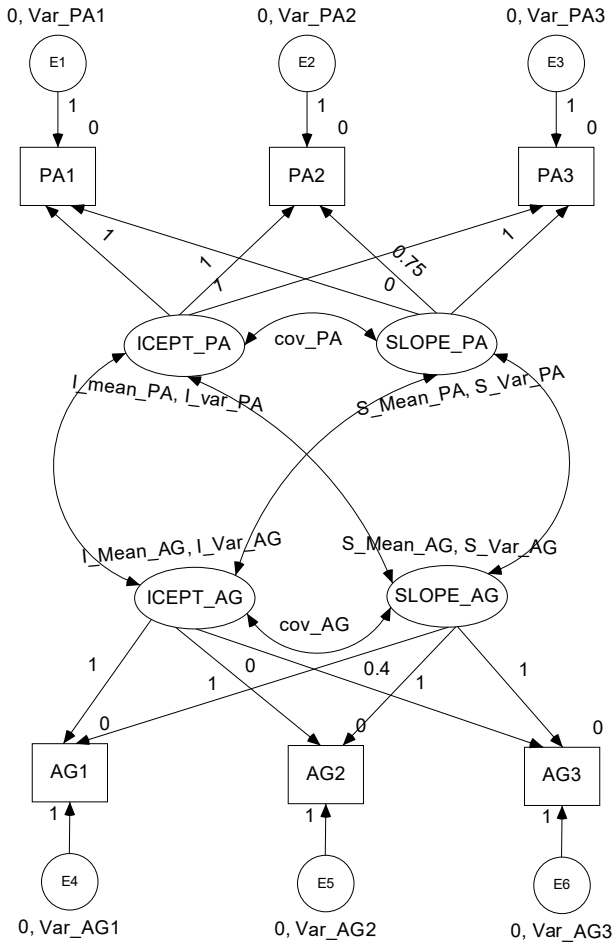
Figure 4
Variables and Paths of the Correlation between Two Latent Growth Curve Models



The model fit indices of the competing models are presented in Table 4. Model 2e emerges as the best-fitting model, with $\chi^2 = 54.8$ ($df = 9$, $p < .001$), AIC = 90.8, BCC = 91.6, and EVIC = .304. When compared to Model 2f, the chi-square difference test indicates equivalence ($\Delta\chi^2 = 1.6$, $\Delta df = 2$, $p = .449$). However, Model 2e is preferred due to its lower AIC, BCC, and EVIC values, confirming it as the optimal model for explaining the relationship between performance anxiety and achievement goal trajectories.

Table 4
Comparison of Nested Model 2

Model	χ^2	*df*	*p*	AIC	BCC	EVIC
Model 2a	282.8	11	< .001	294.8	295.6	.986
Model 2b	134.8	9	< .001	170.8	171.6	.571
Model 2c	64.9	9	< .001	100.9	101.8	.337
Model 2d	93.0	9	< .001	129.0	129.9	.431
Model 2e	54.8	9	< .001	90.8	91.6	.304
Model 2f	53.2	7	< .001	93.2	94.1	.312

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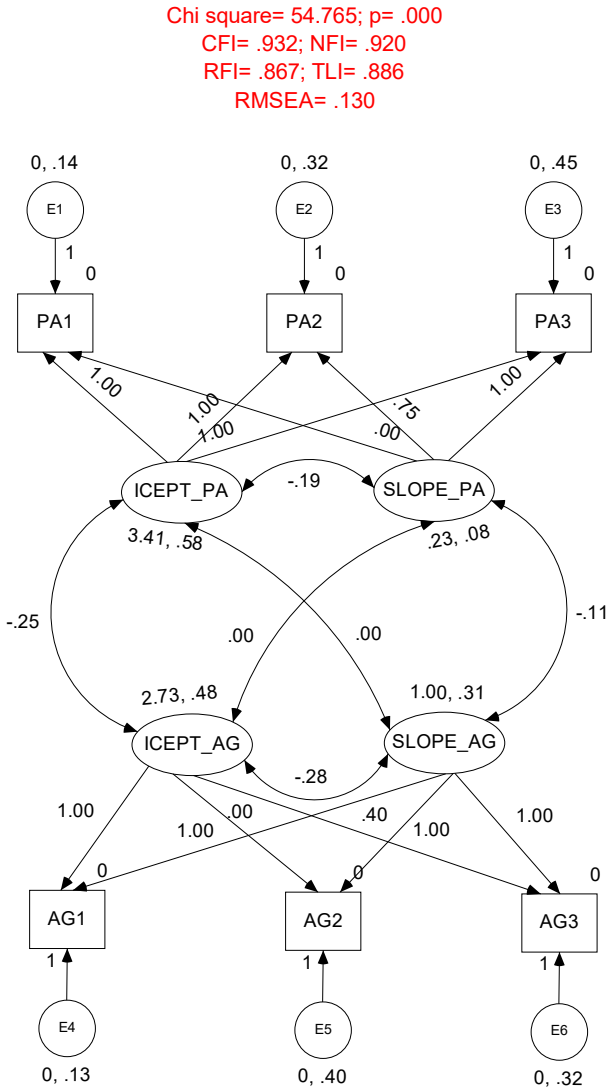
4. Interpretation of Model 2e

The estimated coefficients for Model 2e are presented in Figure 5. The covariances between the intercepts and slopes of AG and PA reveal a significant negative association: Intercept_AG <-> Intercept_PA = -0.25 (t = -8.1, p < .001) and Slope_AG <-> Slope_PA = -0.11 (t = -4.4, p < .001). These findings suggest that the initial levels of performance anxiety have a significant association with achievement goals and that this association persists in their rates of change over time.

Figure 5
Estimated Coefficients of Parameters of Model 2e



Interestingly, the near-zero covariance between the intercept factor of performance anxiety and the slope factor of achievement goals implies that the decline in achievement goal rate of change is not primarily driven by the initial status of performance anxiety. Similarly, the weak association between the intercept of achievement goals and the slope of performance

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anxiety indicates that the change in performance anxiety may be influenced by long-term factors rather than an immediate effect of the initial achievement goal status.

For fixed effects, the means of the intercepts for performance anxiety and achievement goals are 3.41 and 2.73, respectively, while the means of the slopes are 0.23 and 1.00. This suggests that while performance anxiety starts at a higher level, its rate of change is slower than that of achievement goals. For random effects, the variances of intercepts for performance anxiety and achievement goals are 0.58 and 0.48, respectively, with slope variances of 0.08 and 0.31. Thus, performance anxiety displays a broader range of initial levels but a narrower range of change compared to achievement goals.

The residual variances for the observed variables are within a normal range, being 0.14, 0.32, and 0.45 for performance anxiety across the three time points, and 0.13, 0.40, and 0.32 for achievement goals.

5. Interpretation of Results

The findings support the use of Model 2e as the most fitting conditional latent growth curve model for this dataset. Despite some limitations in absolute fit indices (e.g., χ^2 and χ^2/df), the relative fit indices (e.g., NFI, RFI, IFI, CFI) are within satisfactory levels, indicating that Model 2e offers a robust framework for understanding the longitudinal interplay between performance anxiety and achievement goals among preservice preschool teachers.

Discussion

This study provides important evidence about the longitudinal effects of performance anxiety on achievement goals among female preservice teachers involved in STEM education projects. The path analysis model underscores that PA exerts a significant, sustained negative influence on AG, illuminating the inhibitive role that academic anxiety can play in limiting engagement and future learning potential. This aligns with Freedman's (2003) findings that heightened performance anxiety often leads individuals to avoid environments associated with complex learning challenges, potentially stifling meaningful participation in STEM contexts. Such avoidance, as noted by Civelek et al. (2003), can perpetuate disengagement and reinforce negative associations with STEM subjects.

Supporting Mueller's (1992) findings, the present study demonstrates that elevated levels of performance anxiety are correlated with challenges in mastering STEM-related tasks. Similarly, Eyring et al. (1993) observed that task-specific anxiety can impede learning progression. This study reveals that the negative correlations between PA and AG are especially pronounced at critical project junctures (time points 1 and 3), where participants were required to conceptualize and implement STEM projects. Many preservice teachers lacked foundational STEM knowledge, amplifying anxiety, particularly around assignment submission, as noted in Furner and Duffy's (2002) research on STEM-related anxiety.

Interestingly, the path analysis reveals a fluctuating impact of PA on AG, with a temporary reduction in PA influence around time-point 2. This suggests that situational and emotional factors may moderate PA, allowing for a brief enhancement in AG during the middle phase of the project, as noted in Mitchell, et al.'s (1994) research on performance and anxiety. The latent growth curve model further elucidates these temporal dynamics, supporting Ma and Xu's (2003) assertion of a causal link between PA and AG. The analysis also shows significant relationships between the intercepts and slopes of PA and AG. Specifically, while AG begins at a moderate level and increases over time, PA starts high but gradually decreases as preservice teachers become more familiar with STEM tasks, potentially gaining confidence through repeated exposure.

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However, the absence of significant correlations between the intercepts and slopes of PA and AG suggests that while initial anxiety levels may shape early achievement goals, subsequent changes in anxiety do not directly precipitate equivalent changes in AG. This pattern supports Aiken's (1970) theory that emotional responses and achievement are reciprocally related but may not necessarily evolve in parallel. These findings open new avenues for research. Future studies might explore mediating variables such as motivation, self-efficacy, and peer support to clarify the conditions under which PA influences AG in early childhood STEM education.

Overall, this study advances understanding of the impact of performance anxiety on achievement goals among female preservice teachers in STEM. The findings highlight the importance of incorporating scaffolded STEM experiences into teacher training programs to help mitigate PA by fostering gradual familiarity and competence. By creating environments where preservice teachers engage confidently with STEM content, such programs can enhance both STEM education quality and the professional growth of future educators.

Conclusions and Implications

This study contributes to our understanding of the dynamic relationship between performance anxiety and achievement goals among preservice preschool teachers. The findings indicate that the impact of PA on AG is dynamic, varying across time points. Path analysis models reveal that the negative relationship between PA and AG is particularly pronounced at the beginning and end of the assessment periods, with a temporary reduction in the mid-project stage. The latent growth curve model further elucidates these temporal patterns, showing significant negative covariances between the intercepts and slopes of PA and AG. Specifically, while PA exhibits a higher intercept and a decreasing slope, AG begins at a moderate level and increases over time. These results underscore that PA initially has a strong influence on AG, but its effect changes over time.

Several practical implications emerge from these findings. First, given that high initial PA can inhibit AG, future research could focus on strategies such as stress management, coping mechanisms, and confidence-building to better prepare educators for training with a positive mindset. Cognitive-behavioral interventions may also be effective in equipping preservice teachers with tools to manage anxiety proactively. Furthermore, while PA and AG are correlated, their independent rates of change suggest that research could investigate not only strategies for reducing anxiety but also methods for enhancing AG. This could include setting clear, achievable goals, providing consistent feedback, and celebrating incremental successes to motivate preservice teachers. Lastly, future research might examine these dynamics in diverse teacher populations and varied educational contexts to further refine support mechanisms for STEM educators.

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Declaration of Interest

The authors declare no competing interest.

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IMPORTANCE OF "DIALOGUE CAPACITY" IN SUSTAINABLE DEVELOPMENT GOALS COMMUNITY PRACTICES: FROM THE PERSPECTIVE OF SDGs AND ITS EDUCATIONAL REFLECTIONS

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Abstract

In recent years, universities worldwide have actively embraced University Social Responsibility (USR) to address the Sustainable Development Goals (SDGs). Expanding beyond traditional roles in teaching and research, universities now focus on societal service and national development to enhance their social impact. This study examines how the Nordic Walking Program in Xinwen, Budai Township, Chiayi County, Taiwan, employs "dialogic capacity" to support SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality) as part of a university's commitment to USR. The researchers observed classes and interviewed three participants, a coach, and an assistant. These observations and in-depth interviews provide insights into how dialogic capacity aids in achieving SDG 3 and SDG 5.

For SDG 3, the program enhances mental health by fostering emotional support, reducing isolation, and alleviating stress. It also addresses physical health by promoting regular exercise and educating participants on cardiovascular and metabolic risks, motivating healthier behaviors. Personalized coaching and monitoring empower participants to adopt preventive health practices and manage their health more effectively.

The program also advances SDG 5 by creating an inclusive learning environment open to all genders, especially in rural Budai Township, where women often face gender-based limitations. Through awareness and advocacy, the program helps women recognize and overcome discrimination, asserting their right to participate in sports. This inclusive approach not only fosters gender equality but also boosts women's confidence and engagement in a supportive, non-discriminatory setting.

Keywords: *Sustainable Development Goals (SDGs), University Social Responsibility (USR), dialogue capacity, community practice*

Introduction

On September 25, 2015, the United Nations General Assembly adopted the "Transforming Our World: The 2030 Agenda for Sustainable Development." This agenda established 17 Sustainable Development Goals (SDGs) and 169 specific targets. These goals and targets aim to address global environmental, social, and economic challenges through international collaboration, with the goal of promoting sustainable development worldwide (United Nations, 2015; Walker et al., 2019). The SDGs quickly became a central framework for governments, businesses, and educational institutions, covering areas such as poverty eradication, zero hunger, health and well-being, quality education, and gender equality (Allen et al., 2016; United Nations, 2015, 2023). Universities, as key drivers of knowledge creation and social transformation, play a crucial role in advancing the SDGs by enhancing research and teaching, while actively engaging in community service to respond to societal needs and challenges (Gustavo, 2023).

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Universities globally have embraced the SDGs and have strengthened collaboration with local communities through the practice of University Social Responsibility (USR) to promote social progress and sustainable development. Universities have evolved from being solely centers of education and research to becoming proactive agents that address social changes and challenges. Through USR, universities significantly contribute to social well-being, environmental sustainability, and economic prosperity, thereby helping to address complex societal issues (Bell, 1976). However, in community practice, the integration of "dialogic capacity" into the SDGs presents a critical challenge due to the need to negotiate with diverse stakeholders, reconcile traditional perspectives, and adjust power dynamics. Effective communication and dialogic capacity can not only enhance community engagement but also foster a deeper understanding and commitment to SDG-related issues.

This study examines the implementation of USR through the case of the Nordic Walking Program, which was initiated by Associate Professor Ding Wen-Chin of the Department of Sports, Health, and Leisure Studies at National Chiayi University in Xinwen, Budai Township, Chiayi County. The program aims to promote regular exercise among older adults in the community by providing professional sports knowledge. It also integrates the goals of SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality) into the curriculum to enhance self-empowerment, establish healthy lifestyles, and foster lifelong learning attitudes among participants. Specifically, the program focuses on SDG 3.4 (Mental Health), SDG 3.9 (Reducing Health Risks), and SDG 3.D (Health Risk Management) as part of its efforts towards SDG 3. In terms of SDG 5, the program aims to achieve SDG 5.1 (Elimination of Discrimination) and SDG 5.C (Equality of Rights).

This research utilizes in-depth interviews and participant observation to collect data, analyzing how universities use "dialogic capacity" in sports programs to implement the SDGs and fulfill their social responsibilities.

Literature Review

The Concept of Dialogic Capacity and Its Application in USR-Related Research

According to Keyton (2011), communication was the process of exchanging and sharing information through symbols, gestures, language, and other mediums. Feedback serves to confirm understanding. Communication involves more than just transmitting information; it also involves the construction of meaning. Active participation from both parties is essential for successful communication. For example, face-to-face conversations and written exchanges are fundamental forms of interpersonal communication (DeVito, 2019). Therefore, communication is a multi-layered and multi-faceted concept that involves processes such as information transmission, comprehension, and feedback. According to Bohm (1996), dialogue is an open and mutually respectful exchange process in which participants engage in reflective listening and learning to collectively explore and understand issues. This perspective considers dialogue as a specific form of communication that emphasizes deep interaction and joint exploration between parties. The primary goal of dialogue is to achieve mutual understanding and generate new perspectives and insights. The main distinction between communication and dialogue lies in their goals and models of interaction. Communication often focuses on exchanging information and achieving objectives, while dialogue emphasizes mutual respect, cooperation, and collaborative exploration. Therefore, dialogue can be considered a more profound form of communication. It aims not only to solve problems and convey information but also to foster mutual understanding and build relationships.

When "dialogue" is conceptualized as "empowering," it highlights its ability to be executed in practice, which can be seen as a manifestation of agency. Giddens (1984)

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described agency as a continuous process of action, emphasizing the centrality of the actor and the individual's awareness and reflection on their environment. Furthermore, action as a form of subjective activity cannot be separated from the subject, as it represents the subject's engagement and intervention in the objective world (Giddens, 1979). According to Adler and Elmhorst (2008), dialogic capacity facilitates effective information exchange, enhances interpersonal interaction, and resolves conflicts during communication. Dialogic capacity, defined as the ability to express oneself clearly and understand others effectively in dialogue, is a core skill for successful communication. Additionally, Robbins and Judge (2013) emphasized that dialogic capacity promotes information flow, reduces misunderstandings, and enhances overall team performance.

The primary distinction lies in their objectives. Communication often aims to transmit information and achieve practical outcomes, while dialogue emphasizes building relationships, mutual respect, and collective problem-solving. Moreover, dialogue incorporates "dialogic capacity," which refers to the ability to engage effectively in reflective exchanges, as noted by Adler and Elmhorst (2008). This capacity facilitates innovation, conflict resolution, and teamwork by ensuring clear information exchange and reducing misunderstandings (Robbins & Judge, 2013). Unlike general communication, dialogue allows participants to collaboratively explore diverse perspectives, fostering consensus and innovation (Fisher et al., 2011; Gordon, 2011). Therefore, while communication serves as a fundamental mechanism for interaction, dialogue elevates this interaction to a level of shared understanding and relationship-building.

Dialogic capacity is essential for fostering innovation and addressing complex challenges. Dialogue enhances collaboration potential by promoting precise information exchange, reducing misunderstandings, and fostering mutual understanding of needs and expectations (Gordon, 2011). Through dialogue, participants can engage with diverse perspectives, enabling them to collaboratively identify solutions. Constructive dialogue plays a critical role in finding common ground, resolving conflicts, and reaching consensus, particularly in situations where stakeholders hold differing views (Fisher et al., 2011). It also helps stakeholders gain a deep understanding of community needs and establish collaborative relationships for addressing local issues.

This connection between dialogue and dialogic capacity is particularly significant in University Social Responsibility (USR) practices. USR initiatives often involve students participating in community service and practical activities, requiring effective face-to-face communication in diverse cultural and social contexts (Vasilescu et al., 2010). These engagements not only improve students' communication and dialogic skills but also empower them to act meaningfully within social contexts (Jacob et al., 2015). Moreover, universities must actively employ comprehensive communication and dialogue with various stakeholders to promote USR effectively. Dialogue serves as a critical tool for building consensus, fostering partnerships, and crafting actionable plans to achieve shared objectives (Leal Filho & Lange Salvia, 2019). In this way, dialogue becomes a foundational element of USR, aligning academic and social endeavors with broader community goals and ensuring the sustainability and impact of university-led initiatives.

The Concept of Sustainable Development Goals (SDGs)

The concept of the Sustainable Development Goals (SDGs) can be traced back to the 1987 report "Our Common Future" by the United Nations World Commission on Environment and Development. This report first introduced the idea of sustainable development, which aimed to meet the needs of the present without compromising the ability of future generations to meet their own needs (World Commission on Environment and Development, 1987). In 1992, the Earth Summit in Rio de Janeiro further advanced this concept by adopting the "Rio Declaration

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on Environment and Development" and "Agenda 21." These agreements laid a solid foundation for the eventual establishment of the SDGs (Dodds et al., 2016; United Nations, 1992). The 2000 Millennium Declaration by the United Nations General Assembly marked a significant milestone in global political agreements. It addressed global challenges such as poverty, disease, and inequality, leading to the establishment of eight Millennium Development Goals (MDGs). These goals included eradicating extreme poverty and hunger, achieving universal primary education, promoting gender equality, reducing child mortality, improving maternal health, combating HIV/AIDS, ensuring environmental sustainability, and fostering global partnerships (United Nations, 2000, 2015). The success of the MDGs can be partly attributed to their specific and measurable targets, which provided clear directions for progress in developing countries.

In 2012, Rio de Janeiro once again became the global focus during the United Nations Conference on Sustainable Development (Rio+20). This conference introduced the concept of SDGs, which emphasized balanced development across economic, social, and environmental dimensions (Griggs et al., 2013). After three years of global consultations, the United Nations General Assembly formally adopted the "Transforming Our World: The 2030 Agenda for Sustainable Development" on September 25, 2015. This adoption established 17 core goals and 169 specific targets, while also highlighting the roles and responsibilities of higher education in achieving these goals. As of February 2020, the Talloires Declaration, a significant international indicator for promoting sustainable development in universities, had been signed by 509 universities from 57 countries.

The Connection with Taiwan's University Social Responsibility

In Taiwan, 47 universities participated, demonstrating the active involvement and commitment of Taiwan's higher education to global sustainable development (Su, 2020). Consequently, USR has become an indispensable responsibility of modern universities. It encompasses knowledge transfer, social innovation, policy advocacy, and public engagement. Through the practice of USR, universities can actively respond to societal expectations and promote overall sustainable development and progress.

The Ministry of Education and the National Science Council actively promote university-community collaboration through USR practices. This promotes social innovation, fulfills social responsibility, and integrates higher education into the global sustainable development trend (Yu & Chen, 2024). Since 2017, the Ministry of Education has been promoting the "University Social Responsibility Practice Program." This program encourages universities to establish close connections with local communities, address local issues through humanistic care and innovation, and bridge the gap between academia and practice to achieve international alignment (Ministry of Education, 2018). Since 2013, the National Science Council has implemented the USR Practice Program, which emphasizes the role of universities as drivers of social innovation and facilitates collaboration among students, faculty, and communities to address local development challenges (Yu & Chen, 2024). Universities understand local needs, propose concrete action plans, and assist in problem-solving through social practice, thereby exerting a positive social impact (Song et al., 2022).

Taiwan is currently facing health issues among the elderly. The elderly also have limited social interaction within the community. They may encounter problems not only with health issues, but also with a lack of social interaction and effective dialogue, which hinders their ability to rebuild their ideas about proper social interaction and maintain regular exercise. Moreover, they often interrupt their regular exercise due to various factors, such as lack of motivation, low self-confidence, fear of injury, unstable gait, functional decline from illness, financial difficulties, weather conditions, cognitive decline, and lack of exercise partners (Li Wei-Xuan et al., 2009). Therefore, providing a positive class atmosphere and easy access for the elderly is one of the factors that helps them exercise regularly.

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Lin (2011) pointed out that the purpose of dialogue is to eliminate misunderstandings and promote mutual understanding and recognition. Dialogic capacity ensures that the voices of diverse groups, particularly those that are marginalized and vulnerable, are adequately expressed and valued (Fraser, 2003). This illustrated how dialogic capacity fostered broad participation among diverse groups, allowing all parties to fully express their needs and opinions (Cornwall & Gaventa, 2001). Nordic walking was widely used in rehabilitation fields globally to improve physical function and enhance functional mobility (Lin et al., 2022; Chang & Lu, 2015; Dalton & Nantel, 2016; Warlop et al., 2017). A lot of studies have shown that regular exercise improves and enhances physiological, psychological, and social functioning in older adults, preventing disease and reducing the risk of disability (Elder, 2002; Young & Dinan, 1994).

Exercise can prevent hypokinetic syndrome, reduce anxiety, stress, and depression, and promote positive emotional development (Brehm, 2000; Thayer, 1996). Evan (1995) noted that regular rhythmic exercise significantly improves health status and physical function in older adults, reducing risk factors for diseases. With the increasing attention on SDGs, the researchers conducted a walking exercise class in the community to make University Social Responsibility possible and practical. The study specifically explores two research questions: (1) How do the coaches and assistants of the Nordic Walking Program use communication skills to implement SDG 3, and what are the outcomes? (2) How do the coaches and assistants apply communication skills to achieve SDG 5, and what are the impacts?

Research Methodology

Background

This study used in-depth interviews, supplemented by participant observation, to explore how course instructors and teaching assistants of exercise classes in Xinwen, Budai Township, Chiayi County, utilize "dialogic capacity" to achieve SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality), in response to the goals of USR. The detailed research methodology and design are described as follows:

The Walking Class

Xinwen, located in Budai Township, Chiayi County, is an aging community where residents tend to place limited emphasis on physical and mental well-being. Upon learning that National Chiayi University would offer a community exercise program in Budai aimed at promoting the physical and mental health of older adults and providing professional exercise knowledge to advance Sustainable Development Goals (SDGs), the village chief and Budai Township Senior Citizens' Association actively promoted and recruited local participants who were enthusiastic about fitness and contributed to community cohesion. Informed that the program would feature Nordic walking led by a professional coach, community members eagerly registered. A total of 35 participants were selected from Budai's Xincun, Xinmin, Fuxing, and Haomei neighborhoods through a combination of self-assessment and professional physical fitness evaluations.

The Coach and Course Assistants

The lead coach holds certifications as an intermediate national physical fitness instructor from the Sports Administration of the Ministry of Education, as well as a silver-level instructor with the Original Nordic Walking Federation (ONWF) of Finland. In addition, the coach is a graduate student in the Department of Physical Education and Health Leisure Studies at National

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Chiayi University, which brings substantial experience in leading Nordic walking classes. The course assistant, an undergraduate student from the same department, has also gained significant practical experience by working as a course assistant in projects led by department faculty.

Sample

The researcher initially participated in and observed seven sessions, interacting with the 35 participants in order to establish a foundation of trust. Through informal dialogues, the researcher identified seven participants who were more active and expressive in expressing their views on the exercise program. After assessing their interaction with the coach and assistant, the researcher employed purposive sampling to select three participants who agreed to participate in interviews.

The study utilized purposive sampling to select participants for interviews. The suitable respondents were identified through the subproject "Healthy Living Together," which is part of the broader project "Culture, Community, and Communication: Ushering in a New Period of Prosperity for the Southern Area of Budai Township by Collaborating with Local Groups." Professor Ding Wen-qin from the College of Education at National Chiayi University leads this project. The exercise class, which focused on Nordic walking, took place from February 27 to May 24, 2024. Sessions were held every Tuesday and Friday from 9:00 to 10:30 a.m., totaling 24 classes in total.

Each participant signed an informed consent form and took part in in-depth interviews. Interview principles and procedures were as follows: Each interview lasted approximately 30 minutes, with times coordinated with the five respondents. Given the subjective and case-specific nature of in-depth interviews, to minimize biases from "recall after the fact," the researchers employed corrective and strategic questioning during interviews. Transcripts were created post-interview, verified by respondents, or triangulation was used to ensure data accuracy. All participant information was anonymized to adhere to research ethics (see Table 1).

Table 1
Basic Information of the Five Respondents

Name	Gender	Age	Occupation before Retirement	Interview Location	Health Status
Mao	Male	65	Aquaculture	Xinwen Elderly Center	Good
Ying	Female	64	Fishermen's Association Staff	Xinwen Elderly Center	Good
Mei	Female	68	Aquaculture	Xinwen Elderly Center	Good
Coach	Female	23	Master's Student, Dept. of Physical Education and Health Leisure Studies, NCYU	Xinwen Elderly Center	Good
Assistant	Male	20	Undergraduate Student, Dept. of Physical Education and Health Leisure Studies, NCYU	Xinwen Elderly Center	Good

Instrument and Procedures

The researcher used both classroom observation and personal interviews. The researcher first informed the interviewees of the questions through a preliminary phone call, then arranged a suitable interview location and time. If permitted by the interviewees, efforts will be made to schedule interviews in the morning, as interviewees tend to be more alert during this time.

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Each interview session was limited to approximately 30 minutes, with the entire process audio-recorded upon the interviewee's consent. Additionally, the researcher developed an interview outline that addressed specific aspects of conversational engagement, aiming to respond to SDG 3.4 (Mental Health), SDG 3.9 (Reducing Health Risks), and SDG 3.D (Health Risk Management), as well as SDG 5 targets, including SDG 5.1 (Elimination of Discrimination) and SDG 5.C (Promoting Equality of Rights).

To ensure depth in data collection, the researcher attended and observed seven sessions before initiating the participant selection process for interviews. The participant-observation approach continued over an additional 14 sessions, allowing the researcher to closely monitor participants' outward behavior and engagement with the course. The researcher systematically recorded observational findings in a reflective journal for further personal insights and note-taking, enabling the collection of additional usable observations. The researcher also made efforts to avoid leading questions, ensuring an objective and neutral presentation of the research findings.

Coding of Interview Data

The interview data was coded based on the roles of the respondents. Participants were assigned code A, while instructors and assistants were assigned code B. Each target was assigned a number based on the targets from SDG 3 and SDG 5. The final digit of each interview indicated a different interview. For example, in the first interview with Mr. Mao and the coach, Mr. Mao was marked as "Mao A-1-1" and the coach was marked as "B-1-1," and so on. When presenting in the paper, the code "Mao A-1-1" would be transferred into dialogue form. For example, *Mr. Mao: (expressing his ideas)* (A-1-1).

Participant Observation and Reflection on the Phenomenon

This research also uses participant observation as an additional method. The researchers, along with the teaching assistant, actively participated in the exercise classes, observing the behaviors and interactions of the participants. The observations went beyond mere observation; the researchers actively engaged in the social environment and systematically recorded the observations to gain a deeper understanding. For example, an observation record from May 30, 2024, is coded as "20240530 Research Observation," and this coding pattern continues.

Research Results

The Implementation and Effectiveness of "Dialogic Capacity" by Coaches and Assistants in Promoting SDG 3 through Exercise Classes

The Nordic Walking Exercise Class in Xinwen focused on advancing SDG 3 by specifically targeting SDG 3.4 (mental health), SDG 3.9 (reducing health risks), and SDG 3.D (health risk management). The emphasis was on prioritizing mental health, engaging in regular physical activity, and understanding and sharing effective exercise methods for maintaining health. This section explored the process and impact of the coach and assistant using "dialogic capacity" in the exercise classes, based on these three sub-goals:

Implementation of SDG 3.4 (Mental Health) Sub-Goal

Xinwen is a fishing village in Budai with a high population of residents over 60 years old. Initially, the exercise class had low acceptance within the community, resulting in inconsistent

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attendance rates. According to research observations (1130530), most elderly participants were skeptical about the benefits of exercise in improving physical function. Initially, residents were reluctant to participate in the exercise program due to a lack of knowledge about regular exercise and its impact on mental health. The project team invested significant time in engaging with community members to enhance their understanding of the importance of healthy exercise. Moreover, the researchers used constructive communication skills to foster new understandings and perspectives through interaction. The following examples demonstrate how coaches and assistants utilized dialogic capacity to encourage Ms. Mei's participation:

Ms. Mei: What's the benefit of exercise? It's tiring—I'd rather go home and rest.
Coach: Joining the class is not just about exercising; it's also a chance to socialize with friends.
Assistant: Exactly! Your friend, Ms. Fang, really hopes you'll join and become healthier together.
Coach: Sweating boosts metabolism, making you feel younger and more vibrant.
Assistant: Look at Ms. Jun—she exercises regularly, and she's become healthier and more lively.
Ms. Mei: Really? I'll give it a try then. (B-1-1) (B-2-1) (A-3-1)

Similar dialogues between the coach and Mr. Mao further highlighted the impact of exercise on mental health:

Mr. Mao: Can exercise really reduce stress?
Coach: Absolutely. Research shows that exercise promotes the release of endorphins, which stabilize mood.
Mr. Mao: Isn't walking boring?
Coach: We've designed group activities to enhance engagement. It's good for your mental and physical health and strengthens bonds with others.
Mr. Mao: Alright, I'll give it a shot this Friday. (A-1-1) (B-1-1)

The dialogue between the assistant and Ms. Ying reflected how exercise can mitigate feelings of loneliness:

Assistant: Engaging with other participants fosters a sense of belonging, which is vital for mental health.
Ms. Ying: My children have moved away. I do feel lonely. Maybe exercising and making friends isn't a bad idea. (A-3-1) (B-2-1)

Successful aging in highly aged societies requires attention to psychological, physical, and social dimensions. Observations confirmed that social interaction, beyond the benefits of exercise, provided significant psychological satisfaction (Research Observation, 1130430). By utilizing their "dialogic capacity," the coach and assistant gradually gained the trust of the community, helping residents recognize the benefits of regular exercise for their physical and mental well-being. As participants' trust in the coach deepened, they actively engaged in Nordic walking classes, achieving not only physical health benefits but also psychological comfort. This led to the adoption of a more positive and optimistic attitude towards exercise to meet their health needs.

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Implementation of SDG 3.9 (Reducing Health Risks) Sub-Goal

Therefore, exercise not only benefits physical health but also offers significant psychological benefits. Long-term exercise promotes healthier lifestyles in older adults, reducing the need for medical care and, consequently, health risks. The following dialogue illustrated how the coach used "dialogic capacity" to guide Mr. Mao in understanding how exercise reduced health risks:

Coach: When using walking poles, adjust them according to your height and stride for optimal fitness results.
Mr. Mao: You're right—I've had fewer falls since I started using walking poles.
Coach: Remember when you doubted the poles? You thought they were just sticks with no real purpose.
Mr. Mao: Now I see the poles increase arm movement and reduce knee pressure, easing joint strain. (A-1-1) (B-1-1)

Example Dialogue: Coach, Assistant, and Ms. Mei:

Coach: Regular rhythmic exercise can significantly improve older adults' health, enhancing physical function and reducing disease risk.
Assistant: That's right! For seniors, consistent exercise is especially crucial.
Ms. Mei: But I've had a leg injury—won't using walking poles add stress?
Coach: Not at all. Nordic walking with poles strengthens core muscles and reduces knee pressure while effectively burning calories.
Ms. Mei: Really? That sounds like a win-win for exercise without knee strain.
Assistant: Nordic walking poles are widely used in rehabilitation to improve physical function.
Ms. Mei: That's great! I want to join the Nordic walking sessions. (B-1-1) (B-2-1) (A-3-1)

Example Dialogue: Coach and Ms. Ying

Coach: Participating in the exercise class helps prevent sedentary behaviors that lead to obesity and negative emotions.
Ms. Ying: I usually watch TV after meals, which makes me anxious and snack a lot—resulting in fatty liver.
Coach: Medical reports suggest that 30 minutes of exercise a day effectively reduces fat and maintains a healthy weight.
Ms. Ying: I must attend the class and learn the correct techniques to stay healthy. (A-3-1) (B-1-1)

Observations indicated that using walking poles reduces physical strain, encouraging participants to explore how assistive tools can enhance exercise outcomes in a relaxed manner (Research Observation, 1130430). Regular exercise enhanced the awareness of physical capabilities for older adults, helping them understand the importance of appropriate exercise and gradually establishing long-term exercise habits that promoted overall health. In classes, the coach and assistant use guided discussions and dialogues to help participants realize that irregular exercise could lead to negative health outcomes.

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Implementation of SDG 3.D (Health Risk Management) Sub-Goal

These challenges were also prevalent in the Budai Xinwen area. In response, the coach and assistant actively encouraged participants to engage in outdoor activities during classes to prevent functional decline due to illness and reduced the risk of injury caused by an unstable gait. The following dialogue illustrated how the coach and assistant employed their "dialogic capacity" to guide participants Ms. Ying and Ms. Mei in assessing their health risks:

Ms. Ying: I often feel numbness in my hands and feet recently.
Coach: You might want to try joining the brisk walking class; more activity can improve blood circulation.
Ms. Mei: It really helps! Since joining the walking class, my hands and feet have become more flexible, I feel more energetic, and I get sick less often.
Assistant: I've noticed Ms. Mei progress too. When she first came, her movements were uncoordinated, but with continued participation, she has shown significant improvement and can even assist as an instructor now.
Ms. Ying: Really? Then I want to join too! Ms. Mei, let's go together.
Coach: Ms. Mei, why don't you show Ms. Ying some basic movements?
Ms. Mei: No problem. Let's exercise together to prevent functional decline. (B-1-1) (B-2-1)
(A-2-1) (A-3-1)

Elderly individuals often avoid exercise due to a lack of confidence in their abilities, as they fear that injury could impact their daily lives. The coach and assistant helped participants gradually enhance their self-management of health risks through professional guidance and accompaniment. The following dialogue illustrated how the coach and assistant utilized "dialogic capacity" to assist participant Mr. Mao in self-assessing his health risks.

Mr. Mao: I had knee surgery, so exercise isn't suitable for me. I'm afraid of getting injured.
Coach: Having had surgery means you need moderate exercise even more to prevent muscle atrophy.
Mr. Mao: But I'm worried my knees won't handle it, and it might weaken my calves.
Assistant: Don't worry. Just adjust according to your physical capacity and avoid strenuous activities.
Coach: Exactly. If your joints are weak, slow down, and prioritize safety during exercise.
Mr. Mao: I see now that I can adjust the intensity based on my condition rather than avoiding exercise altogether. (B-1-1) (B-2-1) (A-1-1)

The interviews with Sheng-ge and three other participants, as well as the coach and assistant, revealed that the coach emphasized safety in the exercise classes. The researchers showed the participants an open attitude, active listening, and respect for their viewpoints during interviews. The coach also continually reminded participants to be mindful of their condition. The study observation noted that during exercise encouragement, the coach and assistant frequently reminded each other, and participants self-assessed and adjusted their exercise routines accordingly (Research Observation, 1130503). Observations showed that participants highly recognized the professional guidance and health assurance provided by the coach. Communication between the coach and participants was free of hierarchical distinctions (Research Observation, 1130430).

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The Implementation and Effectiveness of "Dialogic Capacity" by Coaches and Assistants in Promoting SDG 5 through Exercise Classes

The Nordic Walking class in Budai Xinwen promoted SDG 5 goals, specifically SDG 5.1 (eliminating discrimination) and SDG 5.C (ensuring equal rights), by fostering gender equality education and equal participation rights. This section explored how the coach and assistant implemented and utilized "dialogic competence" in these exercise classes, and evaluated its effectiveness based on the subgoals mentioned.

Implementation of Subgoal of SDG 5.1 (Eliminating Discrimination) Sub-Goal

In the Budai area, traditional patriarchal views were deeply rooted, in addition to an aging population. Generational differences often lead to communication barriers across generations. Therefore, the coach and assistant proactively communicated with participants to eliminate discrimination when encouraging them to join the Nordic Walking class. In conflict resolution, dialogic capacity also plays a crucial role. The following dialogue demonstrated how the coach and assistant utilizes "dialogic capacity" to assist participants in overcoming gender biases associated with exercise.

Ms. Ying: Traditionally, men work outside, and women stay at home. After work, we should focus on family. There's no way we can go to an exercise class.
Ms. Mei: Exactly. Someone would gossip about you for joining a class after work.
Coach: Not at all! Social views or stereotypes have changed. Exercising after work is beneficial, especially in our professionally organized classes by National Chiayi University, where you can also learn about health. Exercise isn't gender-specific—you see, I'm also a woman.
Assistant: That's right! Our coach is professionally certified and also female, which shows women's capabilities shouldn't be underestimated.
Ms. Mei: Really? I never expected the coach to have such credentials; it's impressive. I want to learn more!
Ms. Ying: I thought women couldn't teach very well, but now I can tell that her teaching is very professional. (B-1-1) (B-2-1) (A-2-1) (A-3-1)

The following conversation with Mao-ge further highlighted the importance of overcoming gender stereotypes:

Mr. Mao: In rural areas, women go home after work to cook and do chores, making it hard for them to exercise. It's usually men who do. We're conservative here.
Assistant: Taking care of the family is good, but why not bring your wife along to exercise?
Mr. Sheng brings Ms. Hui, and they've both become healthier. Wouldn't that be good for your wife too? Why not take her to the exercise class? Exercise shouldn't be limited by gender. Health is what matters most.
Mr. Mao: You are right. I'll ask my wife if she'd like to join the class.
Assistant: We look forward to seeing both of you! (B-1-1) (B-2-1) (A-1-1)

The interviews with Mr. Sheng and other participants revealed that the coach and assistant communicated with empathy and respect. According to the study observation, participants resonate with the coach and assistant's perspectives, embracing the value of gender-neutral exercise, and effectively overcoming gender discrimination (Research Observation, 1130503). This highlighted the significant contribution of "dialogic capacity" in fostering understanding and respect, thereby contributing to the realization of SDGs.

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Implementation of Subgoal of SDG 5.C (Equal Rights) Sub-Goal

True equality should consider these individual differences and provide diverse and extensive learning opportunities to meet the varied needs of the elderly. However, as previously mentioned, traditional patriarchal attitudes still persisted in the Budai area, resulting in lower educational levels for females in this fishing village and a long-standing neglect of their learning rights. The following dialogue illustrates how the coach and assistant used "dialogic capacity" to help Ms. Mei and Ms. Ying overcome their biases towards participating in the exercise class.

Ms. Ying: We used to think that this exercise class was only for wealthy people or men. Women like us rarely participated in community recreational activities.
Ms. Mei: Exactly. I also thought you had to pay a high fee to join. In our rural Budai area, women's rights to learning are not highly valued.
Assistant: Nowadays, gender equality is emphasized, and learning opportunities are not restricted by gender. Everyone can choose exercises that fits their interests, including both of you. Your decision to join the walking exercise class shows your interest in fitness, which reflects the concept of equality.
Coach: Modern society advocates for gender equality, and exercise has no gender or age boundaries. As long as it benefits health, everyone can participate.
Ms. Ying: Indeed, it's a privilege for women to join these exercise classes, suggest techniques to the coach, and meet new and old friends. In the past, women couldn't go out much due to patriarchal norms.
Ms. Mei: That's right. Through the exercise classes, we genuinely feel the progress toward gender equality. Otherwise, our rural community would still be dominated by male voices. (B-1-1) (B-2-1) (A-2-1) (A-3-1)

Mr. Mao and the coach had a dialogue on gender equality, particularly from a male perspective.

Mr. Mao: In our rural areas, the traditional mindset still prioritizes men over women, so these exercise classes rarely encourage female participation.
Coach: Mao, gender equality is the norm today! It's not just about you exercising; it's about couples working out together, which not only benefits your health but also strengthens your relationship. If your wife's health suffers, it will affect her quality of life too. Exercising with her is good for health and provides a chance to chat—it's a win-win situation.
Mr. Mao: That makes sense. I'll encourage my wife to join me, and I'll also encourage my sister. After all, exercise benefits everyone.
Coach: Exactly, exercise is something everyone can do together, and it helps improve overall health. (B-1-1) (A-1-1)

The coach and assistant utilized "dialogic capacity" to foster multicultural understanding, enhance communication, and promote exchange. According to research observations, "Ms. Ying and Ms. Mei were very excited and grateful to actively participate in the walking exercise class, demonstrating the empowerment effects of dialogic capacity (1130503 Research Observation)." The SDGs emphasize cultural understanding, and in USR practice, "dialogic capacity" has become a critical tool in promoting this understanding. Through effective dialogue, Chiayi University's exercise program can better understand and respect the culture and needs of the community, thus building a more inclusive social environment.

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Discussion

The findings of this study demonstrate the critical role of dialogic capacity in advancing the Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality), through a Nordic Walking Class in Taiwan. This discussion contextualizes these findings within the existing literature to explore their implications and relevance.

Dialogic Capacity and Health Promotion (SDG 3)

The study shows that dialogic capacity fosters trust and participation among community members, which, in turn, supports mental and physical health outcomes. Regular exercise in this program reduces isolation and enhances self-confidence, aligning with SDG 3 objectives (World Health Organization, 2015). These findings echo Brehm's (2000) emphasis on the psychological benefits of exercise, which include reduced anxiety and stress. Furthermore, the use of walking poles in the program aligns with studies such as those by Dalton and Nantel (2016), which highlight the rehabilitative benefits of Nordic walking in improving physical function among older adults.

However, initial resistance to participation was observed, which is consistent with the findings of Li et al. (2009) that older adults often struggle with motivation and confidence in physical activities. Dialogic methods were used to mitigate this barrier, emphasizing interpersonal connections and fostering an inclusive environment. According to Bohm (1996), dialogue promotes mutual understanding, and this approach proved effective in overcoming skepticism about the benefits of exercise.

Dialogic Capacity and Gender Equality (SDG 5)

The Nordic Walking Class successfully addressed gender biases, allowing both men and women to equally participate in health-promoting activities. Participants challenged traditional patriarchal views that restricted women's involvement, supporting Fraser's (2003) theory on the transformative impact of inclusive dialogue. Utilizing dialogic capacity to dismantle gender stereotypes aligns with the focus on promoting equal participation in the SDG 5 framework (United Nations, 2015).

The coach's role in demonstrating female competence as a leader challenges existing biases, supporting Robbins and Judge's (2013) assertion that dialogic capacity can shift power dynamics and promote equality. Additionally, this study supports Cornwall and Gaventa's (2001) findings that participatory methods empower marginalized groups by ensuring their voices are heard and valued.

Linking Findings to Broader Literature

These results align with the growing recognition of universities' roles as agents of social change, as outlined by Vasilescu et al. (2010). By integrating community engagement into academic frameworks, universities can simultaneously address societal challenges and fulfill their commitments to University Social Responsibility (USR). This case study reaffirms the potential of dialogic capacity as a tool for promoting sustainable health and social equity.

While these findings are promising, future research should investigate the long-term impacts and scalability. As highlighted by Griggs et al. (2013), achieving SDGs requires sustained efforts and adaptation to local contexts. Therefore, examining how dialogic strategies evolve over time could enhance their effectiveness in broader settings.

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Conclusions and Implications

This study highlights the important role of dialogic capacity in promoting the achievement of Sustainable Development Goals (SDGs), specifically SDG 3 (Good Health and Well-being) and SDG 5 (Gender Equality), through University Social Responsibility (USR) initiatives. The Nordic Walking Program in a rural Taiwanese community serves as an example of how dialogic engagement promotes trust, increases participation, and tackles health and gender challenges in underserved settings.

The findings suggest that dialogic capacity encourages inclusive interactions, promotes regular exercise, and mitigates isolation, thereby contributing to improved mental and physical health (SDG 3). Simultaneously, the program also challenges traditional gender biases, fosters equitable participation, and reinforces gender equality (SDG 5). However, these conclusions are context-specific and should be interpreted cautiously when applied to other settings.

Implications

1. Community Health Enhancement: Universities can empower individuals to adopt healthier lifestyles and reduce health disparities by fostering trust and addressing community-specific barriers.
2. Gender Equality Advocacy: USR initiatives can effectively address deeply rooted cultural biases by leveraging dialogic methods. Encouraging gender-equitable participation in community activities can foster broader societal change and support SDG 5.
3. Strengthening University-Community Partnerships: To maximize their relevance and impact, future programs should adapt dialogic methods to diverse contexts. Feedback: The revised sentence reorders the sentence to emphasize the importance of adapting dialogic methods to diverse contexts.

Limitations and Future Research

The scope of this study was limited to one program and community, which restricts its generalizability. Future research should explore the long-term impacts of dialogic capacity and its scalability in various cultural and socioeconomic contexts. Quantitative data and longitudinal studies could provide a more comprehensive evaluation of dialogic approaches in achieving Sustainable Development Goals (SDGs) through University Social Responsibility (USR) practices. By highlighting the transformative potential of dialogic capacity, this study underscores the significance of fostering sustainable, inclusive, and health-focused communities, affirming the crucial role of universities as agents of social change.

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INITIATING E-ACTIVITIES: APPLYING THE SITUATED LEARNING IN A CLASS WITH TRANSITION

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Abstract

With the rapid integration of digital platforms in education, understanding the shift from traditional to electronic modes of teaching and learning has become crucial for adapting to contemporary educational demands. This study explored the transition from traditional classroom teaching to e-teaching and e-learning, termed e-activities, for enhancing the quality of education in Taiwan, focusing on identifying emerging learning phenomena and addressing related challenges. Thirty-five participants, including the teacher and undergraduate students, in a 36-hour 'Graphic Design with Creative Narratives' course. Using an action-research approach with Lave and Wenger's Situated Learning: Legitimate Peripheral Participation (SL: LPP), the alignments highlighted utilizing triangulation methods to identify emerging phenomena, addressing the implications of failed alignments and delayed changes in student performance, and finally emphasizing facilitate transparency in situated resources. It discovered that 1) rebounding the rate of submission and attendance, 2) building a sense of security, and 3) exceeding the learning outcome were the key emerging phenomena and alignments that could be made amid the transition. This study identified key learning challenges in e-learning transitions, emphasized transparent educational resources, and offered adaptive strategies to enhance engagement and outcomes, aligning with SDG-4 goals and highlighting the need for ongoing exploration of e-activities methods.
Keywords: *e-learning, action research, situated learning, legitimate peripheral participation*

Introduction

Sustainable Development Goal 4 (SDG-4) aims to ensure inclusive and equitable quality education and promote lifelong learning opportunities for all (United Nations, 2015). This goal is a central part of the broader United Nations 2030 Agenda for Sustainable Development, adopted in 2015. SDG-4 recognizes that quality education is not only about increasing school enrolment but also about ensuring that students acquire meaningful knowledge and skills that prepare them to contribute effectively to society. Thus, improving learning outcomes involves designing education systems that focus not only on equal access but also on enhancing the quality of education and ensuring positive learning outcomes for all students (Sayed & Moriarty, 2020; UNESCO, 2020).

Contemporarily, establishing e-learning and e-teaching activities, known as e-activities, via various digital platforms has led to significant progress in modern education (Collins & Halverson, 2010; Maeroff, 2003). Studies have identified that learner-centered innovations bring both positive and negative outcomes for teachers and students (Chang & Lee, 2016; Hadjithoma & Karagiorgi, 2009; Liao et al., 2022; Olszewski & Crompton, 2020; Tuma, 2021;

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Vanderlinde & van Braak, 2010). This shift in educational approaches is consistent with the broader agenda of improving learning outcomes as promoted by Sustainable Development Goal 4 (SDG-4), which seeks to ensure that learning environments—whether digital or physical—are equipped to deliver high-quality education and foster lifelong learning (OECD, 2019).

SDG-4, part of the broader United Nations 2030 Agenda for Sustainable Development, emphasizes the importance of quality education that goes beyond merely increasing access to schools. It advocates for systems that provide meaningful learning experiences and impart essential skills for contributing to society (United Nations, 2015; UNESCO, 2020). Central to this is the goal of improving learning outcomes, ensuring that educational systems are designed not just for equality but also to enhance the quality of education and the outcomes achieved (Sayed & Moriarty, 2020). For example, e-learning enhances learners' cognitive performance and fosters opportunities to develop interdisciplinary communication skills. However, due to the uncertainties associated with managing and supporting students in online environments, e-activities might induce unmet in teachers and students regarding engagement and course management (Almazova et al., 2020; Alqahtani & Rajkhan, 2020; Durante, 2024; Lamanauskas & Pribeanu, 2023; Yueh, 2000).

Research Problem and Focus

In Taiwan, the seed of e-activities has been planted by the Nationa1 Information Infrastructure (NII), which aimed to integrate information technology (IT) into teaching activities since 1994. For instance, firstly, IT would be integrated with other disciplines thoroughly, and it could be part of the curriculum, instructional materials, and teaching activities (Chan, 2022). Secondly, IT would play an essential tool in both teaching and learning, akin to the chalk and blackboard in a teacher's hand (Ünlüer, 2024). Finally, the focus of IT integration in teaching should be on teaching and learning itself rather than on the technology (Collins & Halverson, 2010). However, until the Covid-19 pandemic in May 2021, most of the teaching and learning activities were designed to fit in classroom settings. Taiwan has encountered a massive rapid growth of e-activities in the curriculums using instructional materials regardless of the levels of schools (Ministy of Education, 2021).

This wave of sudden shift has posed significant challenges for teachers and students who were used to learning in classroom settings. Although e-learning and e-teaching activities have offered many advantages, numerous researchers have identified some issues that emerged when implementing the new design online (Almazova et al., 2020; Alqahtani & Rajkhan, 2020; Mseleku, 2020). For instance, inadequate hardware and software that both teachers and students encountered, lack of digital proficiency of non-IT specialists, the translating barriers from the in-person materials into online formats, the evaluations of the teaching quality and assessments, etc. However, there are questions about whether e-activities can really meet teachers' and students' preferences (Chien, 2021; Rau et al., 2021). Although numerous studies have examined trends in educational research related to e-teaching and e-learning (Ministry of Education, 2024; Nikou & Economides, 2018; Valverde-Berrocoso et al., 2024), few of them have explored the collaborative processes and dynamic interplay between teachers and students in e-activities. Wang and Tsai's (2022) study addressed the alignment in e-activities that might occur between teachers and students in responding to the emerging learning phenomena. It claimed that learning is a daily activity and process of making senses towards stakeholders through negotiating and co-constructing "meanings" between teachers and students (Wang & Tsai, 2022).

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Research Aim and Research Questions

To be more precise, how does e-learning initiate? Lave and Wenger's (1991) theory of *Situated Learning: Legitimate Peripheral Participation* (SL: LPP) explained the learning patterns that emerge in teaching scenarios as educators apply the designed curriculum. By utilizing theoretical sensitivity through learning theories for analysis and interpretation, educators could gain more understanding into the emergent phenomena (e.g., low participation rates or poor submission rates for assignments). Lave and Wenger addressed that learning could initiate when learners learned the last skills first, namely *reversing production steps* (Lave & Wenger, 1991, p. 72), and when making structured resources transparent to learners, namely, *structuring resources transparency* (Lave & Wenger, 1991, pp. 91-101). These key concepts could be used to realign existing curriculum mechanisms, materials, or activities, helping learners return to the intended outcomes envisioned by the instructional designers (Marcum, 2006).

Thus, the theory of the SL: LPP would be taken as part of the theoretical framework for exploring the dynamic interplay between the adaptation of e-teaching strategies and the evolving e-learning trajectories of students. Action strategies could be formulated, implemented, and evaluated by continuously identifying and analyzing the challenges and difficulties encountered in e-teaching and e-learning (Huang, 2018; Liao, et al., 2022; Wang & Tsai, 2022). Combining Wang and Tsai's (2022) action-research approach, *Design, Implementation, Emergence, and Alignment* (Wang & Tsai, 2022) and Lave and Wenger's SL: LPP, this study adopted these theories and study results as the theoretical framework in this study (Figure 1) to depict the challenges of e-teaching emerged in the e-learning environment; while on the other hand, it aimed to explore how educators realign their strategies or assist learners in overcoming their e-learning challenges (Lave & Wenger, 1991), such as *1) gaining understanding: what are the emerging learning phenomena* (Marcum, 2006) *and their implications? 2) alignments: how did the teacher align with these phenomena and impact learning?*

Research Methodology

General Background

This study followed the framework in a 36-hour elective course, *Graphic Design with Creative Narratives*, during the spring semester of the 2020/2021 academic year (Figure 1). The course's learning objectives were for the students to understand the targeted group's unmet needs and to develop their abilities to communicate with graphic design, for example, selecting the appropriate materials and then composing and laying out the content for the clients. The course was delivered two hours a week, and the students would complete individually the weekly worksheets for 16 weeks. The teacher gave each individual feedback according to their weekly assignment. The final presentation of the design would be displayed and explained on the designated Facebook group page, which only obtained limited access to the students and the teacher in the course. The action-research approach (Lewin, 1947) and the participation observation technique (Lindeman, 1924), and the Grounded Theory (Charmaz, 2001; Corbin & Strauss, 2015; Glaser & Strauss, 1999) as the analytical method were conducted during the educational activities, with reflections on emerging learning phenomena and subsequent adjustments made to relevant strategies and activities.

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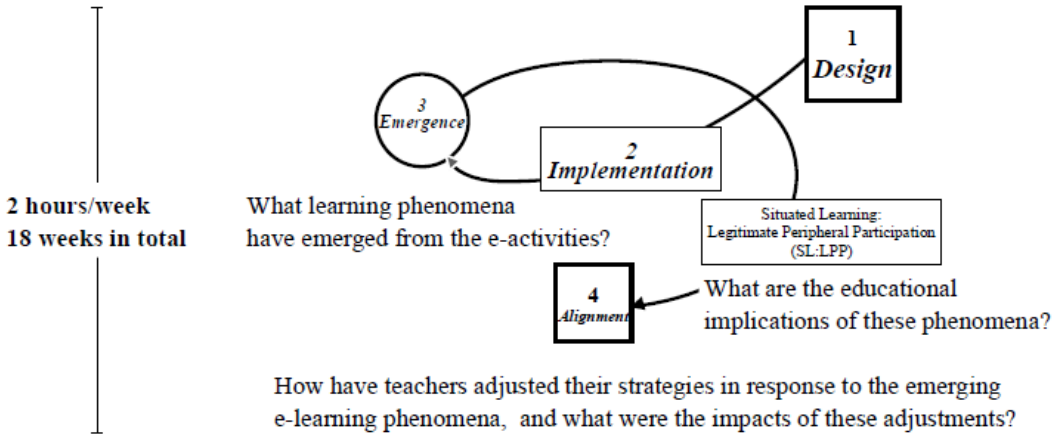
Figure 1
The Conceptual Framework of the Methodology



Research Participants

There were 35 participants, thirteen males and 22 females, in the elective course "*Graphic Design with Creative Narratives"* from February to June in 2021. The participants included one teacher, aged 44, from the Center of General Education; two third-year undergraduate students, aged 20; and the remaining participants, aged 18 and 19, who were first-year students. Among the students, seven were from medicine, two from dentistry, five from pharmacy, five from public health, seven from medical laboratory science and biotechnology, three from health care administration, and five from nutrition and health science. All undergraduate students enrolled at a medical university in northern Taiwan from the summer semester of the 2014/2015 to the 2020/2021 academic year were eligible to opt into this course. The study adhered to ethical standards by ensuring that students' participation in the research component was entirely optional and did not influence their grades or impact their rights within the course. This action-research approach allowed for iterative course improvements based on student feedback, respecting both student autonomy and academic integrity throughout the study.

Instrument and Procedures

Four instruments were designed to collect the dynamic interplay between the adaptation of teaching strategies and the evolving e-learning trajectories of students: 1) Weekly worksheet: it was based on Lave and Wenger's (1991) theory of *Situated Learning-Legitimate Peripheral Participation* to help the teacher track students' e-learning activities and annotation weekly (Lave & Wenger, 1991); 2) a Facebook group page platform and Facebook Messenger were created for communicating and collecting participants' e-activities to make the alignment in e-activities asynchronously, such as giving tasks, explanations, key points, and online exhibitions; 3) I'm@TMU platform was the education management system (EMS) tailored by the Taipei Medical University which allows teachers to upload the learning materials and students to turn in the assignment. It also provided primary statistical data for teachers to perform classroom management online and offline, such as assignment-submitting and student-responding rates; lastly, 4) Google Meet was as the synchronous platform providing real-time responses, explanations to student questions, and live demonstrations during remote sessions.

The procedure in this study was embedded in the 36-hour course, *Graphic Design with Creative Narratives*, and it applied Wang and Tsai's (2022) action research approach,

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Design, Implementation, Emergence, and Alignment (Wang & Tsai, 2022). Table 1 illustrates the original design of the in-person instructional method and supplementary e-activities. The initial 18 hours introduced students to the concept of creative narratives and promoted self-expression through graphic design. Each in-person session consisted of a 20-minute lecture followed by an 80-minute practical exercise, with students submitting their worksheets on the I'm@TMU platform by 23:30 on each class day. Due to the Covid-19 pandemic, the course rapidly transitioned to a fully synchronous format, conducted via the Google Meet platform for the remaining 18 hours. Final project presentations, initially planned for in-person delivery, were adapted to an online exhibition through a designated Facebook group (Table 1).

Table 1
The Original Design of In-Person Approach and e-Activities in the 36-hour Course in 2021

Week	Task (2 hours/ week)	In-Person	e-activities
1-10	• Understanding the course and grading instructions • Discussing on curriculum design and operation, communication and critical thinking (making subjective and objective statements) • Inspecting the difference between native and expert. • Learning how graphics work and analyzing it. • Introduction to graphic design concepts and skills, and skill operation • Finding examples of graphic design, readings and analyses • Deconstructing, collecting, and reconstructing practices • Exploring potential research synergies.	• 20-minute lecture • 80-minute course exercise	• Weekly worksheet submitting via I'm@TMU (by 23:30 on each course day)
11-18	• Learning about creative narrative • Learning the notion and principle of creative narratives • Learning the methods of creative narrative • Selecting a topic on creative narrative and exploring it • Discussing and conducting critical thinking on the selective topic (making subjective and objective statements) • Developing the creative narrative work on the selected topic • Developing and critical thinking the creative narrative work on the selected topic • Exhibition on the Facebook group page	• None (due to Covid-19)	• Synchronous approach via Google Meet • Weekly worksheet submitting via I'm@TMU (by 23:30 on each course day) • Exhibition via Facebook group page

Data Analysis

Using an action-research approach and the participatory observation technique, this study enabled the researchers to gain deeper insights into emerging learning phenomena through firsthand, long-term engagement as participant-observers (Lindeman, 1924). In this study, the teacher, as the researcher, not only engaged in designing the activities in the in-person class but also the e-activities in the synchronous and asynchronous sessions. The one-hour weekly sessions provided a structured schedule to apply the action-research approach iteratively (Lewin, 1947), where the teacher observed students' behaviors, interactions, and practices in

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real time, reflected on these observations, and made necessary adjustments for the following week. This cyclical process allowed for continuous refinement of methods and responsiveness to the evolving dynamics within the learning environment. These approaches probed to employ a diverse range of data sources in analysis to explore the emerging learning phenomenon and alignments taken in the transition from in-person classes to e-activities.

By immersing themselves in course activities, researchers collected rich, context-specific data that enhanced their understanding of learning dynamics and supported responsive course improvements. The data would be deidentified and analyzed using the qualitative technique and conceptualized into categories. Following the recommendations of Lincoln and Guba (1985), steps were taken to ensure the credibility and validity of the research. The data sources were categorized into three main dimensions: 1) the teacher's reflective journals: the teacher played the role of the course designer and deliverer. The course design, preparation, delivery, and classroom observations were included; 2) students' worksheets and final projects via the e-learning; 3) the e-teaching logs in the platforms: logs from the I'm @TMU platform, posts on the Facebook group page, discussion via Facebook Messager, and video recordings from Google Meet. The variety of data sources indicates a "polyphonic" comprehension of the process of e-activities.

Research Results

1) Rebounding the Rate of Submission and Attendance

Emergent Phenomena

A sharp drop in the weekly worksheet submission rate occurred when transitioning from in-person activities to e-teaching and e-learning (Figure 2). Before Week 10, the submission rate was consistently 100%. Both the submission rate for weekly worksheets and student attendance consistently met the expected benchmarks, resulting in no immediate need for instructional adjustments, as no significant learning phenomena emerged. However, a marked decline in both worksheet submissions and attendance was observed, signaling the emergence of a learning phenomenon related to decreased participation. Specifically, the worksheet submission rate dropped significantly to between 38-43%, and attendance in the synchronous e-learning sessions via Google Meet decreased sharply from 94% in Week 10 to 42% in Week 11. On the other hand, the attendance rate suddenly dropped in the synchronous e-learning session on Google Meet from 94% in Week 10 to 42% in Week 11.

Gaining Understanding

A gap between teacher's assumptions and student's learning issues was identified. There was a significant difference between the assumptions made by educators and learners regarding the ease of remote teaching. In this course, the teacher intended to convert the in-person teaching to e-teaching in Week 10 after the midterm exam in Week 9. The episode LD05_FBM2021 illustrated the emerging gap below.

> *Student 5: Teacher, I'm sorry to disturb you over the weekend, but many students have seen the announcement about the meeting, and everyone is quite anxious. Some students really can't use Google Meet due to poor internet connections at home, and they're worried about how the unstable connection might affect you and the other students.*

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Teacher: Oh, are you saying that some students are having trouble connecting to the internet smoothly?

Student 5: Yes, that's right. It's just a few students, though. Most students have understood the instructions you provided on the platform very clearly. However, the system is set to close at 9:50, and for those tasks that take a bit more time, it's not that they're avoiding Google Meet. Rather, they're rushing to complete and upload their assignments before the system shuts down at 9:50.

Teacher: Hmm, I appreciate you telling me this.

(LD05_FBM2021)

Alignments

The alignments toward the low submission and attendance rates were made, respectively (Table 2). An exploration into the causes of the decline was initiated in Week 12. Despite attempts to encourage student participation through targeted messaging in Week 13, these efforts yielded minimal improvement, necessitating continued investigation into the underlying factors contributing to low engagement. The e-teaching approach was also adjusted by providing more detailed guidance on the worksheets and extending the submission deadline to 23:59 on the weekend of Week 14. The alignment 14-1 and 15-2 adopted the theory of the SL: LPP (Lave & Wenger, 1991) to convert the synchronous sessions on Google Meet to the asynchronous approach on the Facebook group page and Facebook Messenger. It allowed students to revisit and refine the e-learning activities repetitively to meet the needs of the weekly worksheet and final project (Liao, et al., 2022).

Outcomes

By Week 12, the submission rate began to rebound. Starting with Week 15, a marked improvement in attendance was observed. The iteration of the work refinement occurred through the alignment of converting the synchronous sessions on Google Meet to the asynchronous approach (Figure 3). It freed the students from the fixed spatial and temporal scales in the preliminary e-activities (Tables 1 & 2). These alignments influenced student's learning. It opened additional learning opportunities (Lave & Wenger, 1991) for students to develop iterative reflection. As a result, one of the students created a 100-page learning portfolio documenting their learning process. The students also displayed academic integrity in their graphic design work, adhering to proper citation practices in their creative narratives.

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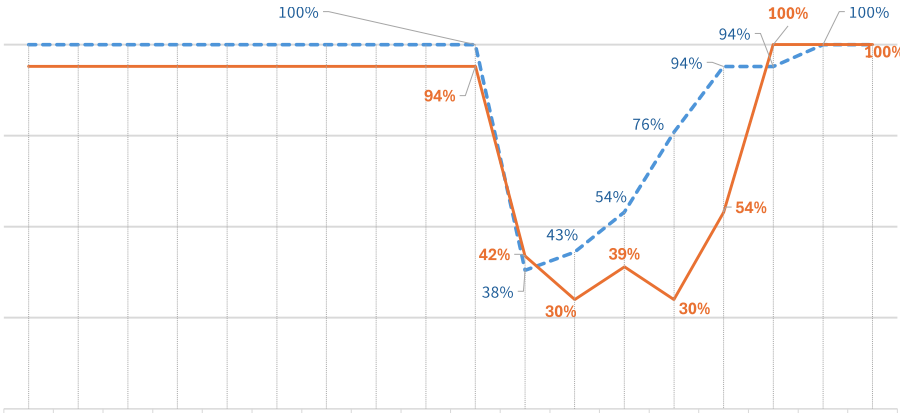
Figure 2
Rebounding the Rate of Submission and Attendance



	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Submission Rate (%)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	38%	43%	54%	76%	94%	94%	100%	100%
Attendance Rate (%)	94%	94%	94%	94%	94%	94%	94%	94%	94%	94%	42%	30%	39%	30%	54%	100%	100%	100%

Figure 3
The Iteration of Students' Work Refinement (100 pages)

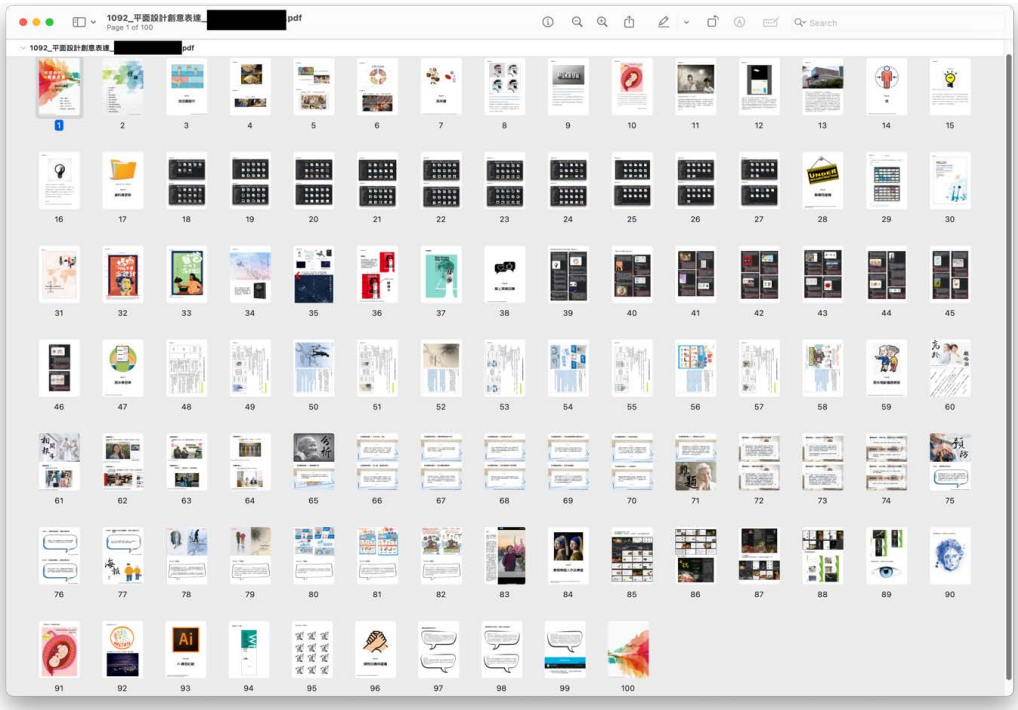


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Table 2
The Action-Research Approach: Making Alignments upon the Decreasing Submission and Attendance

Week	Emergence		Alignment
	Submission Rate (%)	Attendance Rate (%)	
10	100	94	None
11	**38**	42	N/A, **but aware of the emerging learning phenomena**
12	**43**	**30**	N/A, **but aware of the emerging learning phenomena.** **12-1 Exploring the phenomena**
13	**54**	**39**	13-1 Encouraging participation up 13-2 Exploring the phenomena
14	76	**30**	14-1 Change of the e-learning approach: **14-1a:** Students are allowed to learn via **asynchronous** approach (using I'm @TMU+ **Facebook Messager**) if having questions about the assignment. 14-2 Change of the e-teaching approach: **14-2a:** Teacher gave a more detailed instruction on the worksheet. **14-2b:** Extending the submitting deadline: 23:59 by the 14th weekend.
15	94	**54**	**15-1 The alignments** 14-1a, 14-2a and 14-2b **remained.** **15-2 Giving an indicating video** based on the 14th worksheet to help students refine the 15th worksheet.
16~18	-	**-**	Remaining the alignments

2) Building a Sense of Security

Emergent Phenomena

It found no significant difference in the students raising questions between the in-person and synchronous approach. The students would reach out and respond more to the one-to-one conversation in the in-person class, whereas there were fewer signs of reaching out or responses given by the students in the synchronous sessions.

Gaining Understanding

A sense of security might be one of the contributing causes to the non-significant differences in student engagement during the transition from the in-person to the real-time e-activities. The students might be less willing to participate in online activities due to the perceived lack of privacy and increased visibility compared to in-person settings. In the in-person learning settings, students might feel more comfortable due to personal interactions with the teacher, such as one-on-one or small group discussions. This sense of security appeared to be diminished in synchronous online settings where students must raise their hand and ask questions in front of the entire group. In contrast, many students became anxious about being the focus or worried that their questions would seem too basic, which could hinder engagement.

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"In face-to-face classes, the teacher would always come down after explaining something and ask us if we had any questions. But in online meetings, it's harder to ask privately, so most of the time, I have to raise my hand and ask in front of everyone. I often hesitate because it's nerve-wracking to be the center of attention." (S202106101092L)

Alignments

The teacher and students were allowed to conduct further communications via the Facebook Messenger (Table 2, Alignment 14-1a). The e-learning approach was revised to allow students to engage asynchronously through the I'm @TMU platform and Facebook Messenger. It enabled them to seek assistance with assignments at their own pace.

Outcomes

By Weeks 16 and 17, a marked improvement was observed, it generated *new practices* in students' learning inside or outside of the assignments due to increasing a sense of security (Lave & Wenger, 1991). As a result, out of 34 students, twenty-three proactively utilized what they learned in other modules. According to Lave and Wenger's theory, it addressed "*the social relations of apprentices within a community change through their direct involvement in activities; in the process, the apprentices' understanding, and knowledgeable skills develop* (Lave & Wenger, 1991, p. 94)".

"My ability to give immediate responses still needs improvement. When the teacher presents a question or task, I often need a sample or template to guide me before I can start working on a design or issue. It takes me more time to clarify my thoughts, which means I have less time to execute my ideas compared to those who can give feedback right away. In this course, the teacher provided plenty of time to complete assignments, which allowed me to do my best. However, in the future—whether in job interviews or in the workplace—there won't be examples to guide me, nor will there be as much time to think things through."

(S202106101092G)

"……The image at the top is from my parasitology report, while the one below is from my general chemistry report. Whenever I create these kinds of professional reports, I think about presenting them not just to my teachers but also to family, friends, classmates, and even future students. So, beyond delving into the content, I also try various ways to make the reports more engaging……"

(GM9_FB2021)

"The parasitology report was done this semester, while the chemistry one was from last semester. Yes, I did use the techniques you mentioned. The structure, layout, and even the way I write my reports are influenced by scientific papers and journals I've read. I deconstruct them, understand them, and then rebuild my own reports using my own language and ideas……"

(GM10_FB2021)

3) Exceeding the Learning Outcome

Emergent Phenomena

The teacher also found the students no longer meet the previous requirements of the assignment. For example, the students had neglected to address the steps and actions they took when exploring the relevant issues or research reports since Week 11.

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Gaining Understanding

The insufficiency of educational guidance and hands-on practice in e-activities can create significant barriers to mastery of what the students learned and perform align with what the teacher expected. In in-person learning settings, learners typically benefit from clear, direct instruction followed by immediate, hands-on practice under the guidance of an instructor. The in-person approach allows immediate feedback, clarification, and tailored support based on the learners' needs. However, in this study, when transitioning to online platforms, such as real-time platforms and educational management systems, many students' works indicated that instructional guidelines were either too vague or not tailored enough to support independent learning. It could also result in decreased confidence and competency, particularly in healthcare, which relies heavily on practical, skill-based context.

Alignments

Mseleku's (2020) emphasis on supporting educators in delivering e-teaching, this study also focused on enhancing the transparency of educational materials for learners as reflected in alignments 14-2 and 15-2 (Table 2). These alignments made the structured e-activities more visible to students during the transition to e-learning. Without adequate educational information or practice opportunities, the students struggled to connect theoretical knowledge with practical application. It could also negatively affect both engagement and learning outcomes. The alignments provided virtual demonstrations for enhancing the assignment quality, and overall student engagement was strategized. Educational information and demonstration were produced and implemented in Week 14 (Figure 4). These alignments remained in effect during Week 15, accompanied by the provision of additional educational material aimed at helping students refine their Week 15 worksheet submissions (Figure 5).

Outcome

Through the theory of the SL: LPP, the teacher refined the weekly worksheets and provided additional recorded illustrations to assist students facing challenges with their assignments. The findings indicated the alignments to both the e-learning and e-teaching strategies were found to be effective in addressing the emerging learning phenomenon, successfully realigning student performance in the midst of the transition from offline to online. The alignment, *the visual illustration* with text, presented the roadmap of the learning process in the course. From an easy task to a challenge would be understood by the learners. For example, students could allocate where they are in learning from Week 2 and expect the next challenges in the following weeks.

> *"Throughout this semester, I was able to significantly improve my presentation and layout skills through various exercises. Starting with simple memes and moving on to more complex deconstruction and reconstruction tasks, I gained a deeper understanding of the field. Initially, I only knew how to use PowerPoint's basic design functions, but now I've learned to make use of templates, icons, and other features to elevate my designs. I've also been able to immediately apply these new skills to presentations in other classes." (S202106101092L)*

However, educators must recognize that not every adjustment or alignment will yield the desired results. In some cases, a failed alignment can itself give rise to a new learning phenomenon. For example, in alignment 13-1 (Table 2), despite the teacher's efforts to verbally encourage participation, no improvement was observed in either submission or attendance rates. It wasn't until the subsequent adjustments, alignments 14-1 and 14-2, that noticeable changes

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in student attendance and engagement were achieved. This highlights the necessity of ongoing reflection and adaptation in response to emerging learning phenomena during the transition to online learning. These findings contribute to the broader discourse on the challenges of e-learning and e-teaching, aligning with and extending conversations concluded in Alqahtani and Rajkhan's study (Alqahtani & Rajkhan, 2020).

Figure 4

Teacher Produced and Provided Additional Educational Information on the I'm@ TMU Platform

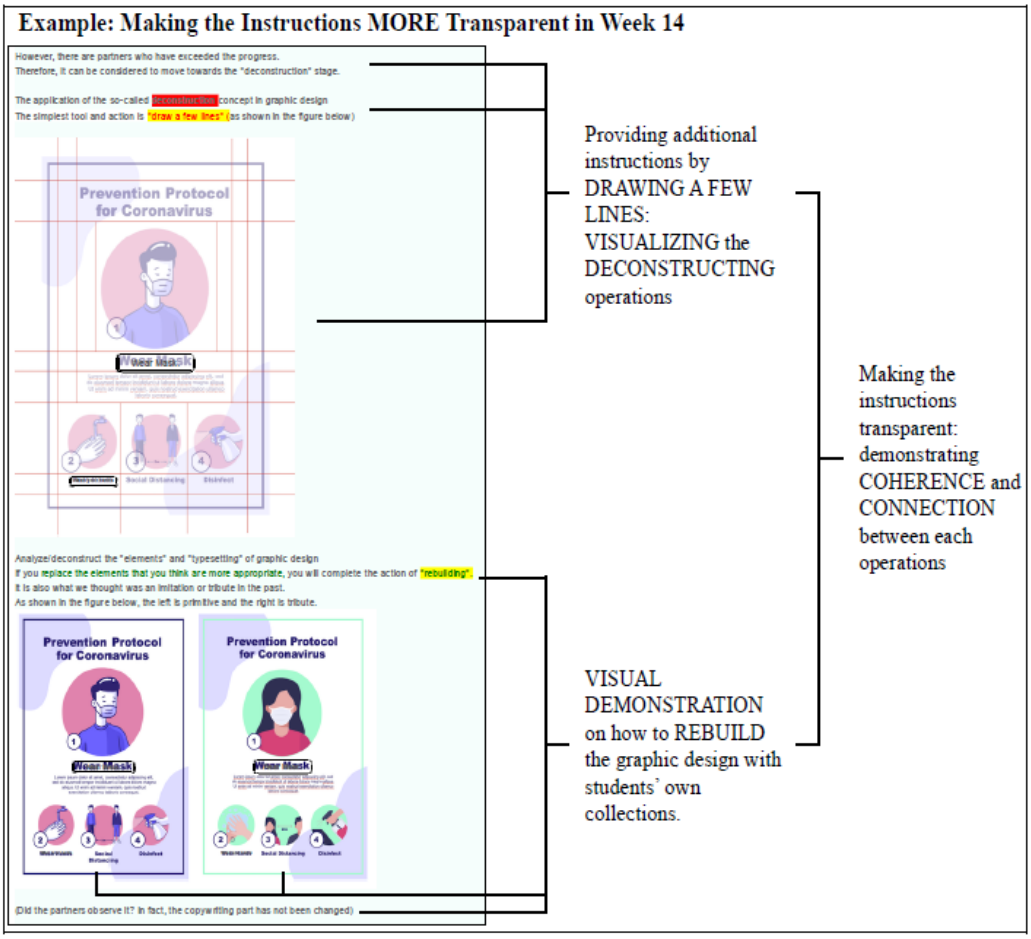
Example: Making the Instructions MORE Transparent in Week 14
However, there are partners who have exceeded the progress.
Therefore, it can be considered to move towards the "deconstruction" stage.
The application of the so-called deconstruction concept in graphic design
The simplest tool and action is "draw a few lines" (as shown in the figure below)
Prevention Protocol for Coronavirus
Wear Mask
Analyze/deconstruct the "elements" and "typesetting" of graphic design
If you replace the elements that you think are more appropriate, you will complete the action of "rebuilding".
It is also what we thought was an imitation or tribute in the past.
As shown in the figure below, the left is primitive and the right is tribute.
Prevention Protocol for Coronavirus
Wear Mask
Prevention Protocol for Coronavirus
Wear Mask
(Did the partners observe it? In fact, the copywriting part has not been changed)
Providing additional instructions by DRAWING A FEW LINES: VISUALIZING the DECONSTRUCTING operations
VISUAL DEMONSTRATION on how to REBUILD the graphic design with students' own collections.
Making the instructions transparent: demonstrating COHERENCE and CONNECTION between each operations

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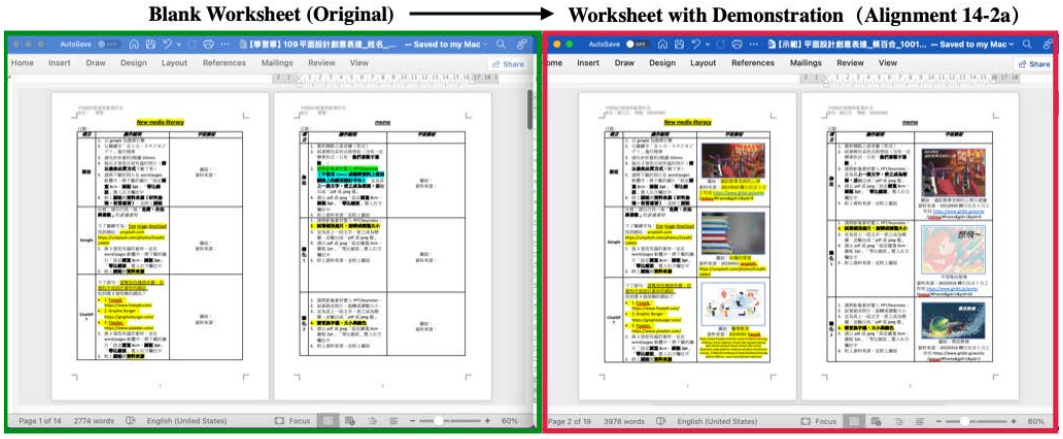
Figure 5
Demonstrations and Examples in the Weekly Worksheet (Alignment 14-2a)



Discussion

This study highlighted several critical barriers encountered during the transition from offline to online learning, notably a decline in assignment submission and attendance rates observed in Week 12. To understand the underlying causes, employing a triangulation approach (Guba, 1981) proved effective. By integrating multiple perspectives—student interviews, educator discussions, and reviews of relevant literature and policies—specific challenges students faced in e-learning activities were identified. This comprehensive analysis underscored the importance of employing diverse methods to unpack complex learning phenomena during such transitions.

One significant finding was the iterative refinement of teaching strategies, particularly the alignment of synchronous sessions on Google Meet to an asynchronous format on platforms like Facebook group pages and Messenger. This adjustment freed students from fixed spatial and temporal constraints, aligning with Lave and Wenger's (1991) theory of Situated Learning: Legitimate Peripheral Participation (SL: LPP). This shift opened *new learning opportunities*, enabling students to engage in iterative reflection, revisit course content, and refine their e-learning activities. Such flexibility catered to the demands of weekly worksheets and the final project (Liao et al., 2022). Additionally, the asynchronous format fostered *new practices*, with 23 out of 34 students applying their learning in other modules, consistent with Lave and Wenger's emphasis on how social participation within a community fosters understanding and skills development.

Moreover, a remarkable example of student engagement was the creation of a 100-page learning portfolio, demonstrating academic integrity and adherence to proper citation practices. It raised an intriguing question: "Does *this represent the development of a new 'identity'?*" as Wenger's Communities of Practice (1998) proposed. While this study could not confirm the emergence of social relationships within the transition due to time constraints, future research could explore this potential identity transformation in greater depth. The findings also emphasized the critical role of continual monitoring and flexibility in e-teaching strategies. Not all adjustments yielded immediate positive outcomes; for instance, verbal encouragement failed to increase participation.

However, subsequent alignments, such as making educational materials more transparent, proved successful. The iterative process reinforced the necessity for educators to adopt a dynamic, reflective approach, aligning with action-research methodologies. This approach not only supported educators in navigating e-teaching challenges but also ensures the continual

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enhancement of education quality and learning outcomes, echoing the goals of SDG-4 (Sayed & Moriarty, 2020). This study also extended Mseleku's (2020) focus on educator support by emphasizing the transparency of instructional materials. Alignments 14-2 and 15-2 (Table 2) improved the visibility of structured e-activities, aiding students in locating their position within the learning roadmap and anticipating future challenges. Recorded illustrations further supported students struggling with assignments, demonstrating how a clear progression from simpler tasks to more complex challenges can significantly enhance learning. This strategy might serve as a valuable model for educators encountering similar challenges.

Therefore, the action-research process demonstrated its efficacy in identifying emerging learning phenomena and implementing reflective alignments. By adapting SL: LPP in e-teaching practices to the realities of e-learning environments, educators could foster student engagement, support skill mastery, and create a more substantial e-learning ecosystem. These findings provided a foundation for future research and practical strategies to improve the quality of education in an increasingly digital landscape.

Conclusions and Implications

The results of this action-research study successfully underscored the complex dynamics involved in transitioning from offline to e-learning and e-teaching environments. By adhering to the action-research approach and Situated Learning: Legitimate Peripheral Participation (SL: LPP), the study identified key emerging learning phenomena and made iterative adjustments to instructional strategies in response to these challenges, such as *1) identifying the emerging learning phenomena*: a gap between teacher's assumptions and student's learning issues, the insufficiency of instructional guidelines and hands-on practice in e-activities, a sense of security might be one of the contributing causes to students' engagement in both in-person and e-activities environment and delayed changes, and 2) *facilitating transparency in the structured resources amid the transition*: the iteration of the work refinement and the visual illustration of the learning roadmap.

These findings are consistent with the goals of Sustainable Development Goal 4 (SDG-4), which aims to ensure inclusive, equitable, and high-quality education for all, with an emphasis on facilitating equitable access to resources and fostering educators' and learners' lifelong learning. Improving learning outcomes aligns with the study's goal of enhancing student engagement and academic performance through adaptive e-teaching methods (United Nations, 2015; UNESCO, 2020; Sayed & Moriarty, 2020). This is particularly relevant in digital learning environments where challenges such as low engagement and difficulties in course management can affect the quality of education. For instance, it has been found that transparency and accessibility of instructional resources were critical in e-learning contexts, particularly when students were asked to navigate asynchronous e-activities. The incorporation of structured resources that students could revisit as needed contributed to improved learning outcomes, as seen in the case of self-regulated learning and enhanced academic integrity in project completion. These alignments not only supported educators in delivering e-teaching but also extended the focus for learners by highlighting the importance of transparent learning design.

This study contributed to the broader discourse on e-activities by demonstrating how emergent learning phenomena could shape both educational strategies and student's learning outcomes. It suggested the challenges of e-learning while offering practical insights into how educators can effectively respond to shifts in student engagement and learning performance during transitions between learning modalities. The implications of these findings highlighted the need for continued exploration into the relationship between e-teaching alignments and student responses, particularly in the evolving landscape of e-activities.

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Declaration of Interest

The authors declare no competing interest.

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INTEGRATING UNIVERSITY SOCIAL RESPONSIBILITY INTO HIGHER EDUCATION: A DESIGN THINKING APPROACH TO RURAL COMMUNITY INNOVATION

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Abstract

This study examines the integration of University Social Responsibility (USR) into higher education through a case study of the "Creativity Design" course at National Chiayi University. The course, supported by Taiwan's National Science and Technology Council, aimed to address challenges faced by Haomeili, a remote village facing the Taiwan Strait to the west in Chiayi County. Utilizing a Design Thinking framework, 54 students engaged in developing innovative tourism solutions for the community. The course structure included technical training, fieldwork, and project execution, with students collaborating with local stakeholders and industry experts. Despite successful project outcomes, including tourism videos, digital maps, and social media campaigns, the study revealed challenges in long-term sustainability and adoption of innovations, particularly due to the community's limited technological familiarity. Logistical issues, such as transportation and coordination, also emerged as significant hurdles. The research highlights the potential of USR courses in fostering meaningful university-community engagement while emphasizing the need for sustained partnerships beyond academic semesters. It underscores the importance of aligning innovative solutions with community needs and technological capacities. The study concludes by suggesting refinements in course planning, the establishment of inter-semester continuity, and the development of strategies to ensure the long-term impact of student projects, providing valuable insights for future USR initiatives in higher education.

Keywords: *University Social Responsibility, community innovation, rural development, design thinking, creative design.*

Introduction

University Social Responsibility (USR) has emerged as a crucial concept in higher education institutions, emphasizing the responsibility of universities to utilize their resources and knowledge for sustainable societal development. USR extends beyond traditional social services, focusing on innovation, sustainability, and civic engagement (Chen et al., 2015). Through USR initiatives, universities play a significant role in supporting social sustainability across multiple dimensions, including social equity, economic development, and environmental protection (Giuffré & Ratto, 2014).

In the educational domain, USR courses integrate students' academic learning with real-world societal issues. These courses emphasize interdisciplinary learning and civic engagement throughout the teaching and learning process, encouraging students to become agents of social

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change (Wigmore-Álvarez & Ruiz-Lozano, 2012). USR courses highlight universities' role as catalysts for community development, fostering meaningful social practice engagement both inside and outside the classroom for students and faculty (Toker et al., 2016). The design of such socially impactful courses enables students to address real-world problems while cultivating a sense of global citizenship (Mohamed, 2015).

Research has demonstrated the positive influence of USR activities on students' university experiences. Gallardo-Vázquez et al. (2020) have shown how social responsibility practices improve learning outcomes, with students participating in USR activities reporting higher levels of satisfaction with their learning and a stronger sense of community belonging. Similarly, Coelho and Menezes (2020) have explored university students' perceptions of USR projects, highlighting how these initiatives foster leadership, teamwork, and social awareness. Their findings suggest that participation in USR projects bridges the gap between academic learning and practical application, preparing students to become actively engaged citizens after graduation.

However, implementing USR courses faces several challenges, particularly in course design and execution. Key difficulties include embedding social responsibility into existing curricula while maintaining academic rigor, adjusting teaching methods, overcoming faculty hesitation to adopt new approaches, and helping students see the connection between social responsibility and their career goals (Do & Huang, 2023). Resource limitations and manpower shortages also pose threats to USR course implementation (Chen et al., 2015). Additionally, the lack of standardized evaluation metrics makes it challenging to track progress, assess impact, and showcase outcomes to stakeholders (Wigmore-Álvarez & Ruiz-Lozano, 2012). The development of USR courses remains in its early stages, indicating the need for more case studies and established models (Liu, 2022).

Recognizing the university's potential and responsibility in promoting social progress, National Chiayi University (NCYU) has launched a series of USR initiatives aligned with the United Nations Sustainable Development Goals (SDGs). Supported by the Humanities Innovation Project funded by the National Science and Technology Council, NCYU has implemented various USR-related activities, including this study.

This research aims to address several aspects related to the implementation of Design Thinking and USR in higher education. The study explores how the Design Thinking framework can be effectively implemented within higher education curricula to promote USR initiatives and identifies challenges arising during this process. It investigates the impact of USR course participation on student learning outcomes and satisfaction. Furthermore, the research examines how USR courses can better align academic outputs with the technological capacities and cultural preferences of target communities. Lastly, it explores key challenges in ensuring long-term sustainability and adoption of student-developed innovations in rural communities through USR courses. These research questions collectively aim to provide a comprehensive understanding of the integration of Design Thinking and USR in higher education, its impact on students and communities, and the challenges that need to be addressed for successful implementation.

Research Methodology

Background

This study employed a mixed-methods approach, combining qualitative and quantitative data collection and analysis techniques to provide a comprehensive understanding of the integration of University Social Responsibility (USR) into higher education through the "Creativity Design" course offered by the Department of E-learning Design and Management at

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National Chiayi University (NCYU). During the fall semester of 2022, both enrolled students' and the community's feedback, and the challenges encountered through the process were collected and recorded for further analysis.

Research Design

For this study, a case study methodology was adopted, allowing for an in-depth exploration of the course within its real-world context (Yin, 2018). This approach enabled a focused investigation of the course's structure, implementation, and outcomes, providing detailed insights into the challenges and opportunities associated with integrating USR into higher education curricula.

Participants

54 students, predominantly in their second year of studies, enrolled in the course. The average age of the students was 20.3±0.3 years, with more than 65% being female. One course lecturer with over 20 years of experience in design education and three guest lecturers specializing in community development and tourism were involved in the course design and development. Four professionals with expertise in photography, social media, website development, and visual design were invited to assist the students with their works during the project phase. Local leaders, business owners, and residents of Haomeili Village were interviewed to provide insights into the region's social, economic, and cultural challenges.

Procedures and Instruments

The research process comprised three stages as follows.

(1) Preparation: This stage involved defining research questions and conducting a literature review to guide the study's direction. Interview guides and surveys were developed to collect data.

(2) Implementation: The course supervisor (the key lecturer for the course) arranged schedules with community participants on the dates to visit. Students and photography professionals attended the event venues and proceeded with planned tasks, such as field observation, interview and leading group activities. And,

(3) Data collection: Fieldwork, observations, surveys and interviews with students and local community members, and student projects were conducted and collected for data analysis.

The research instruments for this study include a questionnaire and a set of semi-structured interview questions. The questionnaire, which contains 15 items, was designed to evaluate students' perceptions of expert contribution, teaching method and course management, and overall satisfaction. The semi-structured interviews, conducted with students, provided qualitative information on the learning experience, course management, the course's practicality, satisfaction, and challenges or suggestions for improvement from the students' point of view.

Data Analysis

The collected data was analyzed using both qualitative and quantitative methods:

(1) Qualitative Analysis: Thematic analysis was employed to identify key themes related to the course implementation, student learning experiences, and community impact. This involved coding interview transcripts, observation notes, and open-ended survey responses.

(2) Quantitative Analysis: Descriptive statistics were used to analyze the survey data, including measures of central tendency and frequency distributions for Likert-scale items.

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Research Results

Course Background

The "Creativity Design" course, offered as part of NCYU's USR initiative, was designed to integrate creative problem-solving with community innovation efforts in Haomeili, a rural village in Budai Township. Haomeili is a small village located in the southwestern corner of Budai Township, facing the Taiwan Strait, with a population of approximately 1,400 people (Budai Township Office, 2023). It is about an hour's drive from Chiayi City, making it a typical remote community in the region. With changes in the knowledge economy and modern industrial lifestyles over the past decades, Haomeili faces challenges such as population outflow and aging and finds it difficult to develop tourism industry.

The course adopted Design Thinking, a well-known problem-solving framework that consists of four main steps: discover, define, develop and deliver (British Design Council, 2005). This process allows students to develop creative solutions that address real community needs. The course was structured into several phases, including technical training, fieldwork, and project execution, where students collaborated with local stakeholders and industry experts to develop tourism-related innovations.

Course Structure and Phases

Introduction to Design Thinking and Community Innovation

In the initial phase, students were introduced to the core principles of Design Thinking and community innovation. Expert guest lecturers presented real-world cases and shared their experiences, giving students a practical understanding of the course's objectives and preparing them for fieldwork.

Group Formation and Technical Training

Students were organized into four specialized groups—Photography, Social Media, Website Development, and Visual Design—according to their interests. Each group was assigned an industry expert for mentorship. Over the three-week period, students underwent intensive technical training to acquire the necessary skills in their chosen focus areas, ensuring they were well-prepared for the subsequent stages of the project.

Fieldwork and Community Engagement

Field visits to Haomeili were arranged throughout the course, allowing students to engage with local stakeholders, including village heads and community members. These visits enabled students to gain deeper insights into the local challenges through interviews and observations. The use of collaborative tools like Line groups facilitated continuous communication and coordination between the students, instructors, and community members.

Mid-term Project Presentations and Feedback

At mid-term, students presented their initial project ideas, receiving feedback from peers, instructors, and industry experts. This stage allowed for refining project scopes and aligning objectives with real community needs.

Project Execution and Consultation

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Students began implementing their projects using the Design Thinking approach, moving from problem definition to prototyping and testing. Industry experts remained involved as consultants, offering feedback and helping students navigate challenges in real-time. This phase was crucial for translating theory into practice, as students worked directly on community-driven innovations.

Lab Production and Group Collaboration

During these weeks, students focused on finalizing their projects, engaging in lab work and group discussions. Mentorship continued through online consultations with industry experts, and the course instructor provided additional support to ensure the projects were polished appropriately and met the community's expectations.

Final Presentations and Exhibition

The final weeks of the course were dedicated to showcasing the students' projects. Presentations were delivered to industry experts, community members, and peers, highlighting both the process and outcomes of their Design Thinking projects. This was followed by a public exhibition where students displayed their work, including tourism videos, digital maps, websites, and social media campaigns promoting local life in Haomeili. This phase allowed students to reflect on their learning process, receive final feedback, and gain insights into presenting innovative solutions in a professional setting.

Course Process and Outcome

The course was designed to foster innovative thinking and practical skills in design within the context of community innovation, focusing on the rural area of Haomeili.

Initial Phase: The course commenced by bringing in expert practitioners to share real-world examples of community engagement. Additionally, design professionals conducted workshops on various topics, including social media marketing, website design, and visual storytelling. These sessions were designed to equip students with the technical expertise required for successful project execution.

Mid-phase: In this phase, students conducted visits to significant local sites to gain deeper insights into community issues such as historical development and ecological challenges. Activities included interviews with community leaders, participation in local environmental initiatives, and visits to cultural and historical landmarks. Students collaborated in interest-based groups, performing their own field research. Common tools used for brainstorming and idea development included mind maps, flow charts, whiteboards, and sticky notes. Furthermore, collaborative digital platforms, such as Moodle, Canva, and Google Cloud, were leveraged to facilitate the sharing and presentation of data and resources across groups, promoting collective problem-solving and project development. Figures 1 and 2 illustrate the students' field visits for data collection and examples of their thinking maps and sketches.

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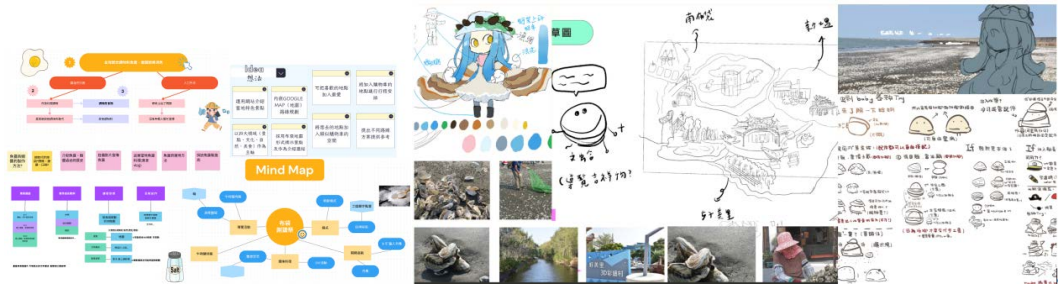
Figure 1
Students Conducting Field Visits for Research and Data Collection

Figure 2
Examples of Students' Thinking Maps and Sketches



Final Phase: Integrating theoretical knowledge, field research, and technical skills, students created a variety of innovative outputs. These included a tourism video, digital maps, a community website, an Instagram account promoting local life, and several digital products like stickers and e-books (Figures 3 and 4). The course concluded with a public exhibition where students showcased their solutions, prototypes, and final designs to an audience of invited guests. They also engaged in reflection on their learning experiences, discussing the challenges encountered during various stages of the project.

Figure 3
Examples of Students' Works—Tourism Maps, DM, Logo, Media posts, Copywriting

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Figure 4
Students' Design Works—Postcards, e-books, Videos, Photos, Social Media Related Designs

Difficulties Encountered and Tackled

Transportation Issues

The major challenges encountered were transportation between campus and community, and establishing connections with local residents. Haomeili, located in Budai Township, is a remote area approximately an hour's drive from Chiayi City, which made it difficult for students to access. To deal with the contact problem, members of the research team acted as liaisons between students and the local community. For the transportation issue, they organized vehicles to drive students to the area in batches and pre-arranged meetings with key local stakeholders, such as the village head, members of the community development association, and business owners. This allowed students to dive directly into observations and interviews upon arrival.

The interview guidelines were shared and coordinated through a Line messaging group. Additionally, if any student had special requests regarding specific personnel or locations, the research team facilitated those needs. For students unable to participate in group activities due to scheduling conflicts, alternative independent visit arrangements were made to ensure they could still engage with the project.

Challenges in Resource Sharing and Task Collaboration

With a large class of 54 students, maintaining effective communication and ensuring cohesive group collaboration presented significant challenges. To address these issues, the course heavily relied on a resource-sharing mechanism facilitated by a cloud platform set up and managed by the course's teaching assistant.

This cloud-based system allowed groups to upload and share collected materials such as ideas, photos, texts, sketches, voice recordings, and design elements. Students were encouraged to not only upload their own materials but also to explore and build upon the work of other groups. This approach encouraged collaboration and resource interaction across groups, fostering a supportive learning environment where students could assist one another in overcoming challenges.

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To monitor progress and ensure uniformity across groups, students were required to submit initial, mid-term, and final reports through the system. This process helped minimize discrepancies in work quality between different groups and allowed for consistent tracking of project development.

Course Feedback

The teaching evaluation (conducted by the university each semester) of this course yielded an average score of 4.67 out of 5.0, which is notably high for this social participatory project being applied in the course for the first time. Following the course completion, an anonymous survey using a 5-point Likert scale was conducted to gauge industry experts' contributions, teaching methods and course management, and overall satisfaction. The survey results are 4.6±0.48, 4.5±0.54, and 4.6±0.5, respectively, reflecting a positive reception of this course.

In the qualitative feedback, students frequently used terms like "excellent," "gained a lot," and "I am dedicated" to describe their experience. The practical project was particularly well-received, with comments such as: "Producing real outputs that everyone can see motivated me to complete them," "The course provided clarity on regional innovation, which was extremely beneficial," and "The promotion of Chiayi Budai's spirit added meaning to the course." Regarding course design, students praised it, stating, "The course was well-structured!" and "This was my first experience working on a large-scale project with the entire class, divided into four groups, supplemented by external resources and professionals. The course's resources were comprehensive."

In terms of the course's practicality and overall satisfaction, students remarked: "The course content was well-matched to our needs," "Collaborating with team members and other groups to create tangible outcomes was very educational," and "The teachers' feedback and assistance during the project were highly valuable and applicable for future job prospects."

However, students did offer suggestions for improvement in three key areas:

Group Discussion: "With students from various grades, it took time to communicate and coordinate," and "Grouping by interest and expertise was fine, and working with seniors was not difficult. However, the group leader's planning and leadership were crucial to the group's functioning. I hope more time can be allocated for the execution phase next time."

Transportation Issues: "Convenience should be considered for on-site interviews," and "The only drawback was that students without transportation or unable to match the teacher's departure time found participation challenging, which occasionally delayed the project's progress."

Course Time Management: "The time allocated for discussions with industry experts could be optimized for more effective exchanges. Experts could help in both initial direction-setting and final output adjustments," and "Students should plan earlier and establish a timeline."

In conclusion, students highly appreciated the course's content, structure, and the instructors' teaching methods. They recognized the value of practical design skills and felt that the integration of promoting Chiayi Budai added significance to the course. The involvement of industry professionals provided valuable, actionable feedback, which students found helpful for both academic and professional development. On the other hand, students highlighted logistical challenges such as transportation and scheduling, which affected participation. Additionally, the tight timeline made it difficult to manage multiple projects simultaneously, which sometimes led to compromises in quality or progress.

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Project Outcomes vs. User Adoption

The "Creativity Design" course aimed to address community innovation challenges in Haomeili through a series of digital design projects, including a website, social media campaigns, LINE stickers, and marketing videos. Students employed on-site observations and interviews to inform their designs, emphasizing local engagement and aesthetics. However, post-course evaluations revealed a gap between the intended project outcomes and actual user adoption.

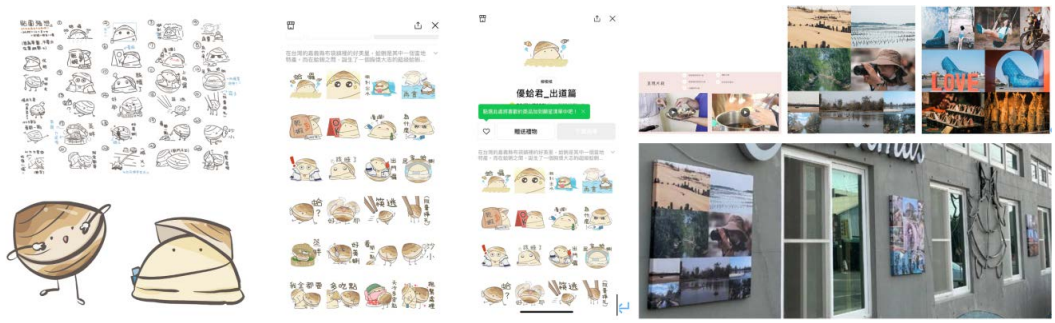
One notable example is the clam-themed LINE stickers (see Figure 5). Although these were positively received for their design, their actual use by the community was limited. Haomeili's elderly population, which constitutes a significant portion of the demographic, did not commonly use stickers for communication, preferring simple text-based greetings. Additionally, purchasing the stickers required mobile payment setups, a challenge for older users unfamiliar with the technology. The option to make the stickers free involved a complex and costly process that was not initially anticipated.

Similarly, the video-guided tours, though requested by local residents, encountered practical limitations. Despite the team's significant effort in production, including data collection, interviews, and editing, playback limitations and lack of appropriate equipment hindered the effectiveness of the videos. Instead, the users reinvented the innovation, enlarged still images from the tour videos were displayed on community building walls, providing a more interactive and accessible experience for local tour guides (see Figure 5).

These findings highlight the complexities of implementing digital innovations in a community with distinct socio-cultural and technological contexts. The disparity between the design intentions and user adoption underscores the importance of continuous feedback and adaptability in community-based projects.

This analysis shows that while digital innovations may meet design objectives, their success depends on aligning closely with the community's technological capacities and cultural preferences.

Figure 5
LINE Stickers Used by Residents and Image Works Displayed on Resident Buildings



Discussion

This study on integrating University Social Responsibility (USR) into higher education through the "Creativity Design" course offers valuable insights into the potential and challenges of fostering community-engaged learning. The findings reveal several key points for discussion:

Effectiveness of Design Thinking and Technology in USR Courses

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The implementation of the "Design Thinking" framework in the course structure, coupled with the use of technology, proved to be an effective approach for addressing real-world community challenges. This aligns with previous research highlighting the value of problem-based learning in fostering social responsibility among students (Wigmore-Álvarez & Ruiz-Lozano, 2012). The students' ability to develop innovative solutions for Haomeili Village tourism-related issues demonstrates the potential of this methodology in bridging the gap between academic learning and practical application.

Technology played a critical role in facilitating the course. The use of cloud-based platforms for resource sharing and collaboration was particularly instrumental in overcoming logistical challenges and fostering teamwork among the large group of students.

Challenges in Sustainable Implementation and Technology Adoption

While the course successfully facilitated the development of creative solutions, the study revealed significant challenges in ensuring long-term sustainability and adoption of these innovations. This finding echoes concerns raised by Do and Huang (2023) regarding the implementation of USR initiatives. The limited technological familiarity and resources in rural communities like Haomeili pose additional barriers to the adoption of digital innovations, highlighting the need for more context-specific and user-centered design approaches in future iterations of the course.

The disparity between the innovative solutions developed by students and their actual adoption by the community raises important questions about balancing creativity with practicality in USR initiatives. This reflects the broader issue of aligning academic outputs with community needs and capabilities, a concern echoed in the literature on university-community partnerships (Toker et al., 2016).

Importance of Continuous Engagement and Logistical Considerations

The study underscores the necessity for sustained engagement between universities and communities beyond the academic semester. This finding supports the argument made by Chen et al. (2015) that effective USR initiatives require long-term commitment and partnerships. The logistical issues encountered, particularly regarding transportation and coordination, highlight the practical difficulties in implementing USR courses in remote communities. These challenges are not unique to this study and have been noted in other USR initiatives (Liu, 2022). Addressing these logistical barriers is crucial for enhancing both the student learning experience and the practical outcomes of such projects.

Student Learning and Satisfaction

The high course evaluation scores and positive qualitative feedback from students align with findings from Gallardo-Vázquez et al. (2020), who noted increased student satisfaction in USR-related activities. The practical nature of the course, the opportunity to work on real-world problems, and the use of modern technology appear to have contributed significantly to student engagement and learning outcomes. This highlights the potential of technology-enhanced USR courses in preparing students for future professional challenges while fostering a sense of social responsibility.

In summary, this study was conducted in a specific rural context (Haomeili Village) with a small sample size of 54 students, which may limit the findings' generalizability to other settings or larger populations. The short-term nature of the course (one semester) restricted the ability to assess long-term impacts and sustainability of the implemented projects. The study

relied heavily on self-reported data from students and community members, which may be subject to bias. Future research should address these limitations to provide more comprehensive insights into the effectiveness of USR initiatives in higher education.

Conclusions

While this research demonstrates the potential of integrating USR into higher education through innovative course design, it also highlights the complexities and challenges involved in translating academic projects into sustainable community development. Future research should focus on developing models for sustained university-community partnerships that extend beyond single-semester courses, addressing logistical challenges, and enhancing the alignment between innovative solutions and community technological capacities and cultural preferences. By addressing these aspects, USR initiatives can more effectively bridge the gap between academic learning and meaningful community impact, fostering a new generation of socially responsible professionals.

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Declaration of Interest

The authors declare no competing interest.

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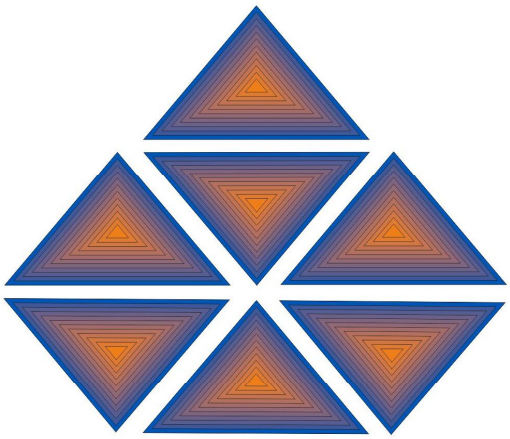

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